

THE GENERA *EPISCIA*, *ALSOBIA*, *NAUTILICALYX*, AND
PARADRYMONIA (GESNERIACEAE)

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The genus *Episcia* has been one of the most vaguely defined taxa of the neotropical Gesneriaceae. In Munich, Martius founded this genus in 1829 for two herbaceous species he had collected about ten years earlier near Rio Japurá in the Province of Amazonas, Brazil. The two species share a similar floral construction, but differ in vegetative habit, and are regarded today as non-congeneric.

The first species, the white-flowered *Episcia decumbens* Mart., is a soft-stemmed terrestrial herb of the shady rain-forest, 1/3 - 1 m tall, decumbent, rooting at the nodes, and without stolons. The other, *Episcia reptans* Mart., is a low-growing, ± rosette-forming, usually lithophytic plant, up to 10 cm tall; it is also found on mossy trunks of trees. In addition to seed production, this red-flowered species also reproduces vegetatively by stolons like the strawberry of the temperate flora. Martius also added a third species to his new genus by transferring the Caribbean *Besleria melittifolia* L. to *Episcia*. This magenta-flowered species is indeed closely related to *E. decumbens*. Although *E. reptans* was the second species described in *Episcia*, later workers in the neotropical Gesneriaceae have consistently regarded this stoloniferous species as the type of the genus (Hanstein, 1854, 1865; Bentham, 1876; Fritsch, 1893-94; Sprague, 1912; Leeuwenberg, 1958). Formal proposals to this effect were made by Sprague (1912) and Leeuwenberg (1958).

To differentiate the genus *Episcia* from the other 14 genera in the newly established family Gesneriaceae, Martius cited only floral and fruit characters: the infundibular corolla, the nectary consisting of a posterior gland at the base of the superior ovary, and the fruit as a subglobose, membranaceous, bivalved capsule, with numerous oblong seeds.

Many new species were later attributed to *Episcia*, including five more species with stolons. Counting present-day undescribed herbarium material and recent live collections, the genus *Episcia* sensu lato would include more than 98 species.

There were, however, early recognitions that *Episcia* contained rather diverse elements. Bentham at Kew created in 1846 the genus *Centrosolenia* for a species later transferred to *Episcia* as *E. hirsuta* (Benth.) Hanst. At Berlin in 1854, Hanstein established six new episcioid genera, leaving only *E. reptans* in *Episcia*. Three of Hanstein's genera, *Alsobia*, *Nautilocalyx*, and *Paradrymonia*, are considered valid again today (Wiehler, 1973a, 1973b). Eleven years later, because of insufficient differentiating floral characters, Hanstein included these new genera and Bentham's *Centrosolenia* in the synonymy of *Episcia* which then contained about 17 species considered valid today (Hanstein, 1865). Bentham at Kew divided *Episcia* into six sections for Genera Plantarum (Bentham, 1876), and this same system was also adopted by Fritsch (1893-94) at Graz in Engler & Prantl's Die Natürlichen Pflanzenfamilien.

Sprague (1912) at Kew was the next botanist to deal with the unwieldy *Episcia* complex. He resurrected the genus *Nautilocalyx* and transferred to it nine species described in *Alloplectus* Mart. (like *Episcia*, another vaguely defined taxon), *Centrosolenia*, and *Episcia*. Since that time *Nautilocalyx* has

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been accepted as a valid genus, although there are no obvious differentiating floral characters to separate *Nautilocalyx* from *Episcia*. Sprague also recommended the re-institution of Hanstein's other episciid genera (*Alsobia*, *Centrosolenia*, *Paradrymonia*, and *Skiophila*), but he did not publish any transfers from *Episcia* sensu lato to these genera except for *Nautilocalyx*.

Sprague thought he had found a valid generic character to separate *Episcia* sensu stricto (he knew the type species *E. reptans*, and *E. cupreata* and *E. lilacina*, all three of which are stoloniferous) from the other discordant elements in *Episcia*: the position of the ovules on the two surfaces of the placenta within the ovary. After an examination of herbarium material he stated that the three stoloniferous species had ovules on both the inner and the outer surfaces of the parietal placenta while all other episciid taxa observed by him had ovules only on the inner surface of the placenta. This distinction breaks down completely, however, when additional species, unknown to Sprague in 1912, are checked, and more importantly, when living material is examined. In the mature fruit of *E. reptans*, *E. cupreata*, *E. fimbriata*, *E. lilacina*, *Alsobia punctata*, *Nautilocalyx panamensis*, *N. melittifolius*, *N. aeneus*, *Paradrymonia ciliosa*, *P. decurrens*, *P. flava*, and in the majority of the neotropical Gesneriaceae examined, the fertile region of the placenta lies at or surrounds the distal tips of the placental arms protruding into the cavity of the capsule as seen in cross-section (Plate 1). In longitudinal sections or in the ripe loculicidal and bivalved capsules these fertile regions appear as two protruding ridges down the center of the inside of each concave valve (Figures 15-17). The terms "inner" and "outer" surface do not seem applicable to this condition. There appear to be only species-specific differences between the configuration of the placenta, the thickness, length, and angle of the arms of the placenta, and the amount of pressure produced by the mass of seeds and funiculi which push these placental arms against the carpel wall. In *E. hirsuta*, *N. panamensis*, *A. dianthiflora*, *A. punctata*, and in the four illustrated species of *Paradrymonia* the tips of the fertile regions of the placentae are flattened (Figures 4, 6, 9-14), and in *N. melittifolia* the same tips are enlarged (Figure 7). It is almost impossible to make accurate observations on ovule position on herbarium specimens, because in the dried and shrivelled fruit the placental shape and position are distorted. The same holds for ovule position at anthesis in herbarium material. In any case, an examination of live material indicates that ovule position is not a valid generic character for differentiating the episciid taxa.

Sprague's intuition to divide *Episcia* into several genera appears nevertheless justified, even though he employed an invalid criterion for separation. An intimate knowledge of live material of the majority of the 98 species of the episciid taxa through field work and greenhouse observations makes it abundantly evident that the only valid and clear-cut gross morphological character for a generic division of the unwieldy genus *Episcia* is plant habit. This feature is not obvious from limited herbarium material viewed with the traditional emphasis on floral and fruit characters used in temperate zone plant taxonomy. In taxonomically difficult taxa with a generalized floral structure directed towards one particular mode of pollination (i.e. ornithophily or gynandro-euglossophily), the *vegetative habit* has gained in importance in recent years for the botanist working on a more accurate fixation of generic limits in tropical plant families (Bromeliaceae, Orchidaceae, Acanthaceae, Gesneriaceae, and probably other groups). Adolf Engler at Berlin started already 100 years ago (1876-1920) to revise the generic delimitations

of the Araceae based primarily on vegetative characters, a classification system still generally accepted today (Michael Madison, personal communication).

The latest revision of *Episcia* was undertaken by Leeuwenberg (1958) at Utrecht. His study is based mostly or completely on herbarium material,

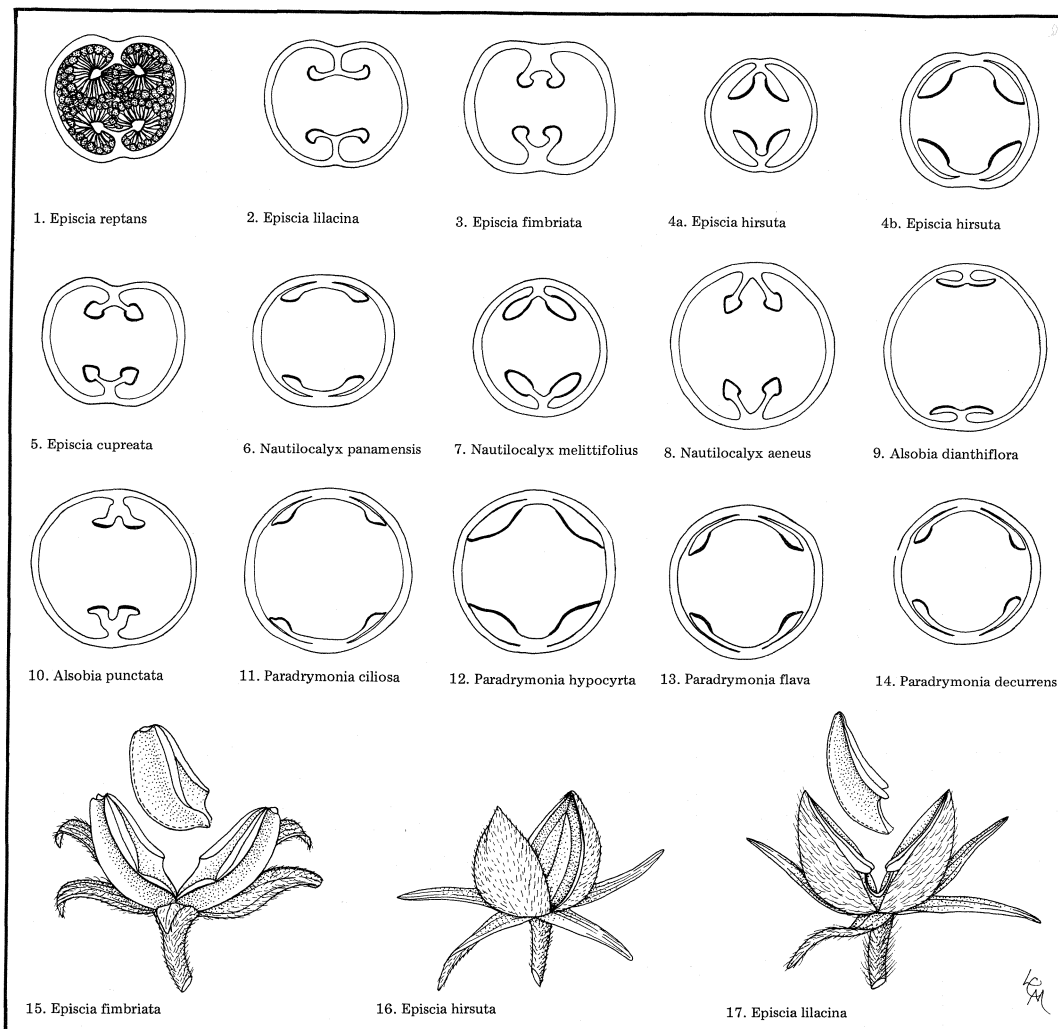


PLATE 1: PARIETAL PLACENTATION IN SPECIES
OF THE *EPISCIA* COMPLEX

Figures 1-17.

Figures 1-14: Cross-sections (at mid-point) of nearly mature ovaries. The fertile regions of the placental arms are indicated by heavier lines. 1. *Episcia reptans* 'Iquitos,' with funiculi and seeds attached to the fertile region of the placental arms; 2. *E. lilacina* 'Panama White'; 3. *E. fimbriata* 'Moore's Green'; 4. *E. hirsuta*, W-1868, a, immature fruit; b, almost mature fruit; 5. *E. cupreata* 'Gray Lady'; 6. *Nautilocalyx panamensis*, G-1095; 7. *N. melittifolius* 'St. Vincent'; 8. *N. aeneus* 'Roezl's Bronze'; 9. *Alsobia dianthiflora*, W-2282; 10. *A. punctata*, G-722; 11. *Paradyrmonia ciliosa*, W-1877; 12. *P. hypocyrta*, W-2246; 13. *P. flava*, W-1745; 14. *P. decurrens*, W-1742.

Figures 15-17: Mature split capsules showing placentations, with cut-outs of the placental arms. 15. *Episcia fimbriata* 'Maas' Bronze; 16. *E. hirsuta*, W-1868; 17. *E. lilacina* 'Selby's Best.' The "G" and "W" numbers represent SEL greenhouse accession numbers.

like the previous work on this genus. He did not follow Sprague's suggestion to exclude the "discordant elements which (make) it impossible to define the genus satisfactorily" (Sprague, 1912, p. 86), although Leeuwenberg tacitly recognized Sprague's separation of *Nautilocalyx* from *Episcia*. Instead he again employed the broad and vague concept of Hanstein (1865) and Benthams (1876) and proposed further sectional and subsectional divisions based partially on plant habit, leaf shape and texture, anther cell position, and ovule position on the placenta. This sectional arrangement appears, however, unclear since there is no key provided for it. Yet Leeuwenberg also stated that *Episcia* "is one of the most critical genera of the family" (1958, p. 308). He recognized 35 species in *Episcia*, and 10 species in *Nautilocalyx*. His study clarified the difference between the subsection *Centrosolenia* (in the section *Episcia*) and the large section *Paradrymonia*, thus allying the stoloniferous *E. hirsuta* (the type of *Centrosolenia* Benth.) with the other stoloniferous species. (C. V. Morton had in the two decades before 1950 revived *Centrosolenia* as a genus and described species now referred to *Paradrymonia*.) Leeuwenberg's treatment is the first modern revision of *Episcia*. The wealth of information assembled in it is commendable, as is the first-time emphasis on plant habit in the *Episcia* complex.

The biosystematic approach to the *Episcia* problem employed in the present investigation stresses that the episcioide taxa, whether seen as sections within *Episcia* or as separate genera, can be understood only in the context of all the genera of the tribe Episcieae which consists of 17 genera (without the episcioide taxa) and over 630 species. In fact, a thorough knowledge of these genera is an essential prerequisite before dealing with any of the problematic taxa of this tribe, especially *Episcia*. The biosystematic approach used here is also based on an evaluation of generic characters within the tribe and within the subfamily Gesnerioideae, and takes into consideration the genetic and hybridization data, the information on pollination and the axioms of pollination biology, and the observations gathered through field work, greenhouse cultivation and laboratory investigation.

The tribe Episcieae forms a very natural unit and is rather distinct from the other four tribes of the subfamily Gesnerioideae. In the last 15 years the Gesneriaceae have become one of the extensively cytologically surveyed plant families. The wealth of cytological and hybridization data has now begun to make an impact on taxonomic consideration. In the tribe Episcieae, for instance, all genera have a base chromosome number of $x = 9$, with the exception of two epiphytic genera, *Codonanthe* (about 20 species, $x = 8$) and *Nematanthus* (about 26 species, $x = 8$). These base numbers do not occur in the other tribes of the subfamily. Most of the genera of the Epis-

PLATE 2: EUGLOSSOPHILOUS FLOWERS OF SPECIES
OF NEOTROPICAL GESNERIACEAE

Figures 13-38

(Typical corolla colors: white, cream-white, or light yellow)

18. *Alsobia dianthiflora*, W-2282; 19. *A. punctata*, G-722; 20. *Episcia fimbriata* 'Dudley's Silver'; 21. *E. hirsuta*, W-1868; 22. *E. sphalera*, Maguire 47023 (NY); 23. *Nautilocalyx adenosiphon*, G-756; 24. *N. aeneus* 'Roezl's Bronze'; 25. *N. bullatus*, G-132; 26. *N. colombianus*, W-1509; 27. *N. dressleri*, Dressler 4258 (SEL); 28. *N. forgetii*, G-133; 29. *N. lynchii*, G-288; 30. *N. membranaceus*, W-1817; 31. *N. panamensis*, W-1502, from Panama; 32. *N. picturatus*, G-938; 33. *N. villosus*, W-1874; 34. *Paradrymonia ciliosa*, W-1877; 35. *P. decurrens*, W-1742; 36. *P. lineata*, W-1601; 37. *P. lurida*, W-1302; 38. *P. ommata* L. Skog, Kirkbride & Duke 437 (MO).

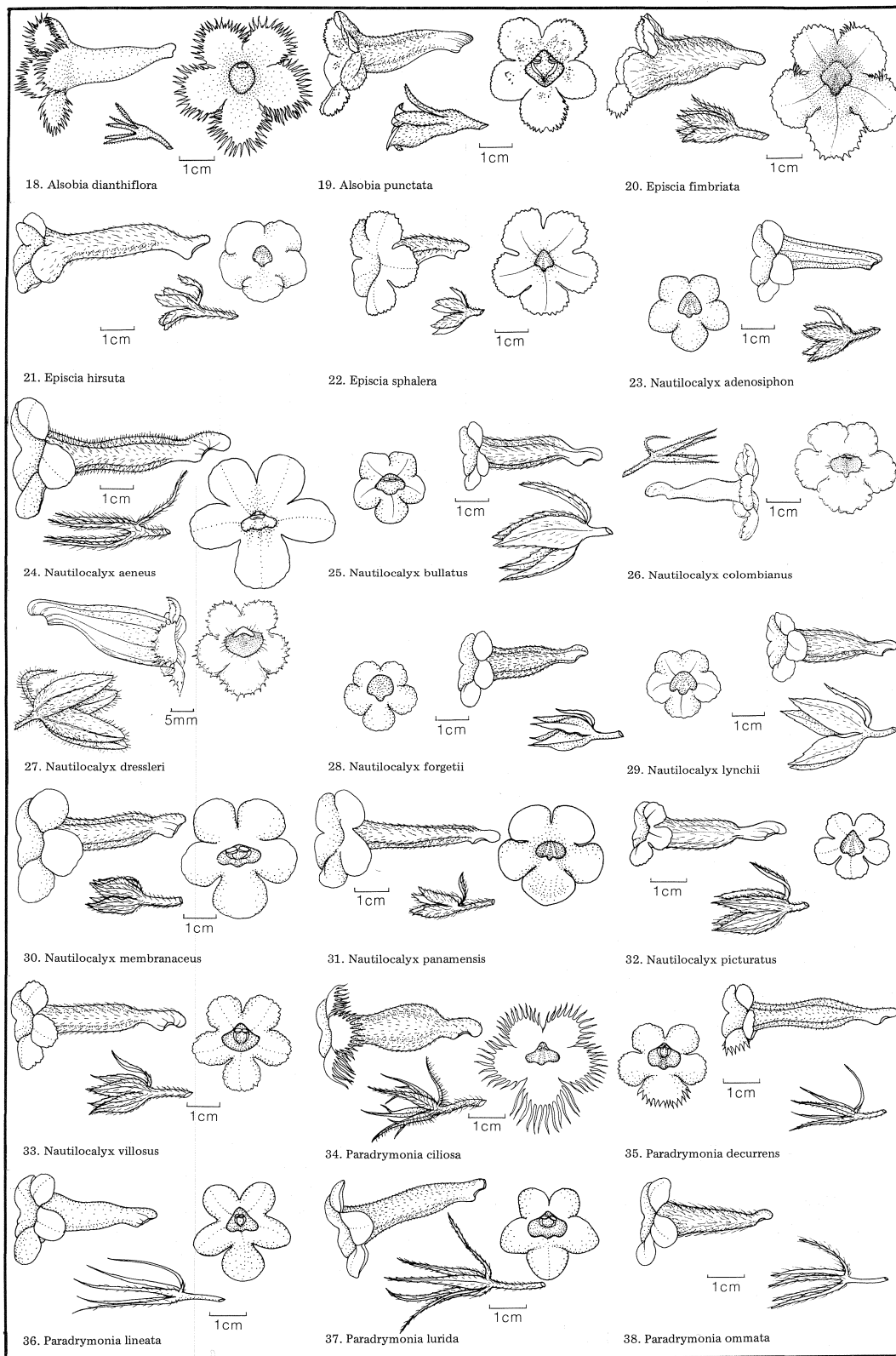


PLATE 2

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TABLE I: FOUR DIFFERENT TYPES OF HUMMINGBIRD COROLLAS
FOUND IN GENERA OF THE NEOTROPICAL GESNERIACEAE

The corollas are typically red or orange, and when yellow (rarely white), they are associated with red calyces, or red bracts, or the leaves feature abaxial red extrafloral attraction patterns. Genera outside the tribe Episcieae are listed in parentheses.

1. THE TUBULAR COROLLA (see Plate 3)

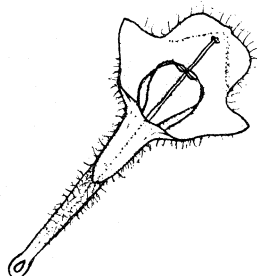


Dalbergaria
Pentadenia
Trichantha — found in the majority of species

Drymonia — in a few species
Cobananthus — monotypic
Paradrymonia — in *P. densa*

(*Heppiella*), (*Gesneria*), (*Sinningia*), (*Moussonia*),
(*Kohleria*), (*Capanea*), (*Solenophora*),
(*Achimenes*).

2. THE COLUMNEOID COROLLA (see Plate 4)

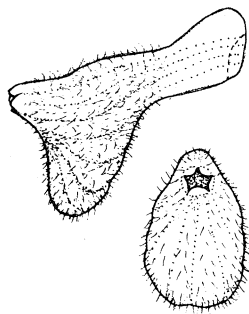


Columnnea — typical for the whole genus

Dalbergaria
Pentadenia
Trichantha — in a few species

(*Sinningia*) — in the *S. cardinalis* complex
(*Asteranthera*) — monotypic

3. THE HYPOCYRTOID AND THE URCEOLATE COROLLA (see Plate 5)

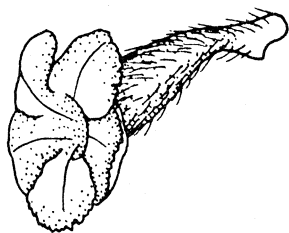


Nematanthus — in the majority of the species

Alloplectus
Drymonia
Corytoplectus
Pentadenia
Neomortonia
Paradrymonia — in a few species

(*Pearcea*) — monotypic
(*Besleria*) — in many species
(*Gasteranthus*) — in many species

4. THE CONVERTED RED EUGLOSSINE COROLLA (see Plate 6)



Episcia — in *E. cupreata* and *E. reptans*
Nautilocalyx — in *N. kohlerioides*, *N. porphyro-*
trichus, etc.

Paradrymonia — in undescribed species and pro-
bably in *P. hansteiniana*.

Drymonia — probably in *D. conchocalyx* and
others.

ciae appear to be fairly closely related, and both sterile and partially fertile artificial intergeneric hybrids have been obtained (Wiehler, 1976; Saylor, 1978).

The special evolutionary developments in the tribe Episcieae are a peculiar nodal anatomy, epiphytism, ornithophily, and euglossophily. The node in all taxa of this tribe with opposite-decussate and estipulate leaves is three-trace trilacunar, although the family Gesneriaceae belongs to an order characterized by one-trace unilacunar nodes. The node of the Episcieae is, however, not the conventional trilacunar node. There are only four gaps (lacunae) in the stele at a node, two median and two lateral gaps. The lateral bundle leaving a later gap, splits in the cortex to travel in opposite directions, each split trace going to one of the opposite leaves. An investigation into the ontogeny of the vascular structure of seedlings in the tribe Episcieae shows the split-lateral three-trace trilacunar node in this tribe to be derived from the one-trace unilacunar situation (Howard, 1970; Wiehler 1970, 1979). The trilacunar node separates the tribe Episcieae from the other tribes of the subfamily Gesnerioideae which have one-trace unilacunar nodes. All genera in the episcoid complex, *Episcia*, *Alsobia*, *Nautilocalyx*, and *Paradrymonia*, have the same peculiar type of three-trace trilacunar nodes.

A strong development of epiphytism is another special feature of the tribe Episcieae. The genus *Peperomia* (over 600 species) in the Piperaceae excepted, the tribe Episcieae contains the largest number of epiphytes of any subfamilial taxon among the dicotyledons, namely over 414 species. Since the Episcieae contain over 630 species, about 2/3 of them have left the floor of the rain forest and adapted to an epiphytic habitat in their search for more sunlight. The only other epiphytes in the subfamily Gesnerioideae occur in the tribe Gloxinieae, with a ratio of about 13 epiphytes to over 300 terrestrial species. There are about 114 epiphytic species in the Old World subfamily Cyrtandroideae, most of them in Asia and in the tribe Trichosporeae. Four species are epiphytes among the 18 species of the small austral subfamily Coronantheroideae.

A third characteristic of the tribe Episcieae is ornithophily and euglossophily. More than half of its species (over 350 species) are pollinated by hummingbirds. In fact, it is foremost the spectacular hummingbird flowers of the epiphytic species which give a note of distinction to the Episcieae. Yet the ornithophily of this tribe has to be seen in a larger context. I estimate that about 60% of the neotropical Gesneriaceae are hummingbird-pollinated. It is not accidental that the center of distribution (Colombia and Ecuador) of the Gesnerioideae, coincides with the center of distribution of the neotropical bird family Trochilidae. The hummingbirds contain over 320 species, or about 450 well-defined forms or subspecies (Thompson, 1964; Fisher & Peterson, 1964). Other modes of pollen transport in the Gesnerioideae include about 30% gynandro-euglossophily (pollination by iridescent neotropical male and female Euglossine bees in search of nectar), and a total of about 10% of chiropterophily, psychophily, sphingophily, phalenophily, myophily, and andro-euglossophily (male Euglossine bees gathering fragrance compounds). The honey bees (*Apis mellifera* and related species), prominent pollinators in the temperate zone of Europe and North America, are absent from the neotropics. The term "melittophily" for bee flowers in the tropics is too vague and therefore useless. It does not take into account the utterly different phenomenon of the male euglossine pollination system, and obscures the decisive flower specificity of the many species of Euglossine bees involved in the gynandro-euglossophilous pollination system. While the same

single species *Apis mellifera* may visit a whole range of flower shapes and sizes during the northern flowering season, the numerous species in the five genera of Euglossines, each varying in size and coloration, and limited by geographical distribution and probably also altitude or habitat preferences, are quite specific in their choice (size, shape, and color) of the euglossophilous flower type they can visit successfully throughout the whole year. Although several species of both *Nautilocalyx* and *Drymonia* with euglossophilous flowers exist sympatrically and bloom at the same time in Ecuador and Colombia (Wiehler, unpublished data), no hybrids have been observed. Yet such hybrids can be produced with ease artificially in cultivation. Euglossophilous corollas of species of the *Episcia* complex and of other genera of the tribe Episcieae are illustrated in Plates 2 and 3.

Four different types of hummingbird corollas are found in the Gesnerioideae and Episcieae, as listed in Table I and illustrated in Plates 4-7. All of these corollas have the typical red, orange or strong yellow coloration: 1. the tubular corolla with a narrow and more or less straight (or somewhat inflated) tube and a narrow, subregular limb; 2. the columnneoid corolla, with a narrow but expanding tube and a strongly zygomorphic limb divided into a prominent galea (hood) consisting of the two enlarged dorsal lobes, with two triangular lateral lobes, and a long and narrow ventral lobe; 3. the hypocyrtoid or urceolate corolla with an inflated tube and a very constricted throat and a very narrow regular limb [this type of corolla is labelled hypocyrtoid when the tube has a ventrally inflated pouch, as in the former genus *Hypocyrtia* (= *Nematanthus*), a taxon based solely on corolla shape]; 4. the converted Euglossine corolla, with a moderately wide tube and a wide subregular limb (this type of corolla apparently represents a 'recent' adaptation from euglossophily to ornithophily).

The typical Euglossine corolla is either white or light yellow, often with a purple, rose, or lemon nectar guide. The Euglossine corolla converted to ornithophily has changed to red or orange (Plate 7). The large genus *Columnnea* sensu stricto has now only one corolla type, the columnneoid corolla, but the same type is also found in the three genera recently segregated from *Columnnea*: *Dalbergaria*, *Trichantha*, and *Pentadenia*. The same columnneoid corolla also occurs in other gesneriad tribes: in the monotypic genus *Asteranthera* (subfamily Coronantheroideae), and in the red-flowered species of *Sinningia* (tribe Gloxinieae). Yellow tubular corollas are characteristic of the genus *Dalbergaria*. Since these yellow corollas are usually fairly small, somewhat hidden in the foliage, and from a distance unattractive to the potential

PLATE 3: EUGLOSSOPHILOUS FLOWERS OF SPECIES
OF NEOTROPICAL GESNERIACEAE

Figures 39-59

(Typical corolla colors: white, cream-white or light yellow)

39. *Codonanthe chiricana* Wiehler, W-2267; 40. *C. corniculata* Wiehler, G-932; 41. *C. crassifolia* (Focke) Morton, Wiehler 7109 (SEL); 42. *C. gracilis* (Mart.) Hanst., W-1720; 43. *C. luteola* Wiehler, W-1630 (tetraploid); 44. *C. uleana* Fritsch, W-2124; 45. *Codonanthopsis dissimulata* (H. E. Moore) Wiehler, G-926 (clone of type material, from Iquitos, Peru); 46. *C. dissimulata* variant, W-2235 (from Huanuco, Peru); 47. *C. ulei* Mansf., W-2200; 48. *Drymonia aciculata* Wiehler, W-1540; 49. *D. dressleri* Wiehler, W-2256; 50. *D. ecuadorensis* Wiehler, W-1155; 51. *D. laciniosa* Wiehler, W-1555; 52. *D. macrophylla* (Oersted) H. E. Moore, W-1550; 53. *D. pulchra* Wiehler, W-1567; 54. *D. sulphurea* Wiehler, W-1544; 55. *D. turrialvae* Hanst., Wiehler 7118 (SEL); 56. *D. warszewicziana* Hanst., Dodson s.n., 1977 (SEL); 57. *Gasteranthus dressleri* Wiehler, W-1104; 58. *Neomortonia rosea* Wiehler, W-2367; 59. *Sinningia richii* Clayberg, G-1011.

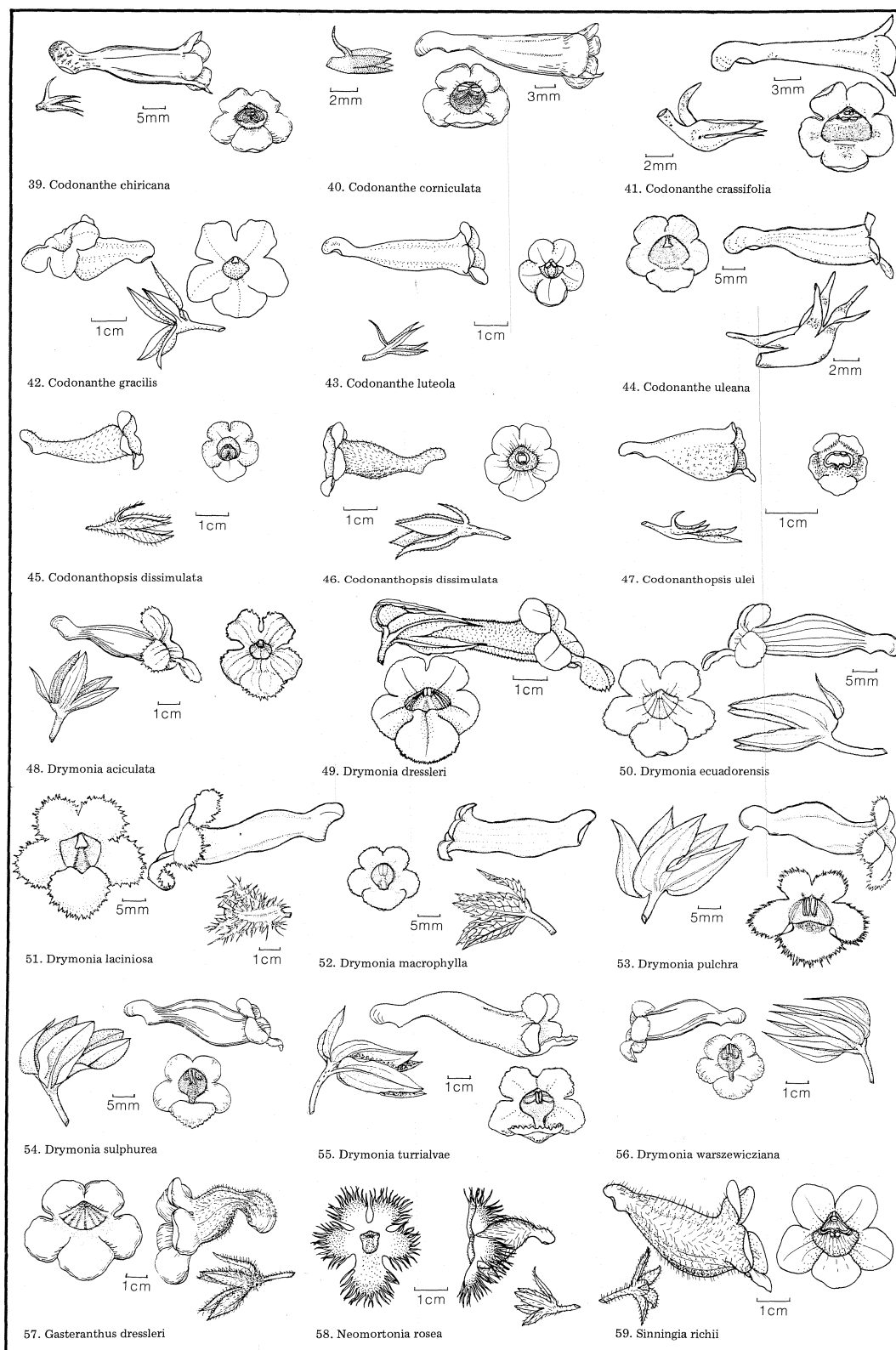


PLATE 3

 18-19
 18-19

pollinator, many species of *Dalbergaria* have devised extrafloral attraction patterns for the inquisitive hummingbirds: there are bright red translucent spots on the lamina of the leaf which shine like a red stained-glass window in the sunlight, or red borders, dots, or spotting on the abaxial leaf surface. The reason for the differences in the shapes of the first three hummingbird corolla types is not known at present, although the columneoid and hypocyrtoid corollas appear to be derived from the tubular type.

There appears to be no obvious correlation in the Gesneriaceae between ornithophily and the inferior ovary position (Grant, 1950), at least not for the tribe Episcieae in which all taxa have a superior ovary. Semi-inferior or completely inferior ovary positions are characteristic for the tribes Gloxinieae and Gesnerieae whose species are pollinated by either birds, insects, or bats.

The nectary of the taxa of the tribe Episcieae, including the *Episcia* complex, is a large, double-connate, dorsal gland, with the exception of the genera *Pentadenia* and *Corytoplectus* which have two or more glands. The fruit of the Episcieae is either a berry (*Codonanthe*, *Columnea*, etc.), or a display capsule with reflexed carpel valves and a cone-shaped mass of funicles and seed (*Alloplectus*, *Drymonia*, *Nematanthus*, and *Codonanthopsis*), or a cup-shaped capsule in which the two valves open to an angle of about 45°. All species of the *Episcia* complex have the latter type of fruit.

The genus *Episcia* has been a problematic taxon in the Gesnerioideae because of an overemphasis on floral characters based on a lack of knowledge of pollination biology in this subfamily. There are over 150 species in the tribe Episcieae with gynandro-euglossophilous flowers, all of them with a similar pattern of construction and coloration (white or pale yellow). Unless these species had other distinct features, like an unusual androecium or a different type of fruit, they were mostly attributed to the genus *Episcia*. Euglossine corollas occur also in the genera *Drymonia*, *Codonanthe*, *Codonanthopsis*, *Alloplectus*, and *Neomortonia* in the tribe Episcieae, but these taxa were easily recognized as separate from *Episcia* by their specialized anthers (*Drymonia*, *Codonanthe*), or by their distinct fruit (a showy display capsule in *Codonanthopsis* and *Alloplectus*, a berry in *Neomortonia*). The following species, traditionally assigned to *Episcia*, have typical gynandro-euglossid corollas: *E. hirsuta*, *E. sphalera*, *E. fimbriata*, *E. bicolor*, *E. adenosiphon*, *E. bryogeton*, *E. decumbens*, *E. membranacea*, *E. mimuloides*, *E. panamensis*, *E. ciliata*, *E. decurrens*, *E. densa*, *E. lurida*, *E. maculata*, *E. dianthiflora*, *E. punctata*, and most species in the genus *Nautilocalyx*. The following euglossid flowers in *Episcia* sensu lato have converted to ornithophily: *E. reptans*, *E. cupreata*, *E. porphyrotricha*, *E. kohlerioides*, *E. lucianii*,

PLATE 4: ORNITHOPHILOUS FLOWERS IN SPECIES
OF NEOTROPICAL GESNERIACEAE: THE TUBULAR COROLLA

Figures 60-80

(Typical corolla colors: red, orange or bright yellow)

60. *Alloplectus sprucei* (Kuntze) Wiehler, W-2145; 61. *Bucinella paramicola* Wiehler, W-1679; 62. *Cobananthus calochlamys* (Donn. Smith) Wiehler, W-2016; 63. *Dalbergaria ampliata* Wiehler, *Dressler 5543* (SEL); 64. *D. asteroloma* Wiehler, W-2247; 65. *D. florida* (Morton) Wiehler, W-1347; 66. *D. polyantha* Wiehler, W-1152; 67. *D. vittata* Wiehler, W-2265; 68. *Pentadenia angustata* Wiehler, W-1751; 69. *P. colombiana* Wiehler, W-1710; 70. *P. crassicaulis* Wiehler, W-1666; 71. *P. ecuadorana* Wiehler, W-1176; 72. *P. matudae* Wiehler, G-919; 73. *P. spathulata* (Mansf.) Wiehler, W-2165; 74. *P. zapotalana* Wiehler, W-1119; 75. *Trichantha ciliata* Wiehler, *Madison 4065* (SEL); 76. *T. citrina* Wiehler, W-2451; 77. *T. filifera* Wiehler, W-1631; 78. *T. herthae* (Mansf.) Wiehler, W-1573; 79. *T. minor* Hooker 'Firebird. 80. *T. sanguinolenta* (Oersted) Wiehler 'Black Frill.'

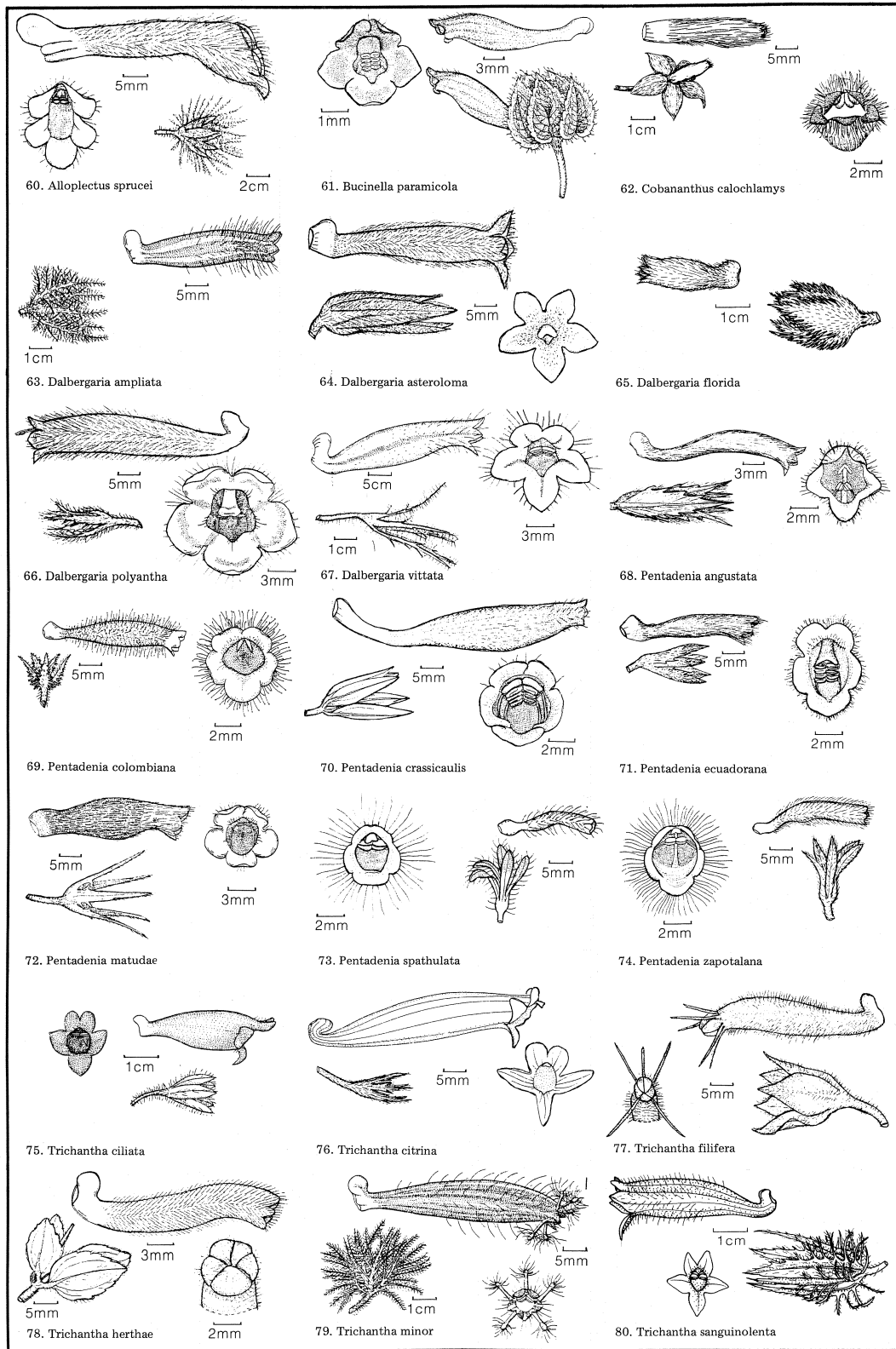


PLATE 4

NGZ 40

E. melittifolia, and possibly *E. urticifolia*. One species of *Episcia* has shifted to butterfly pollination: the psychophilous corolla of *E. lilacina* (Figure 116), usually pale blue, resembles that of *Achimenes grandiflora* and *A. longiflora*. No other non-euglossophilous flowers in *Episcia* sensu lato are known.

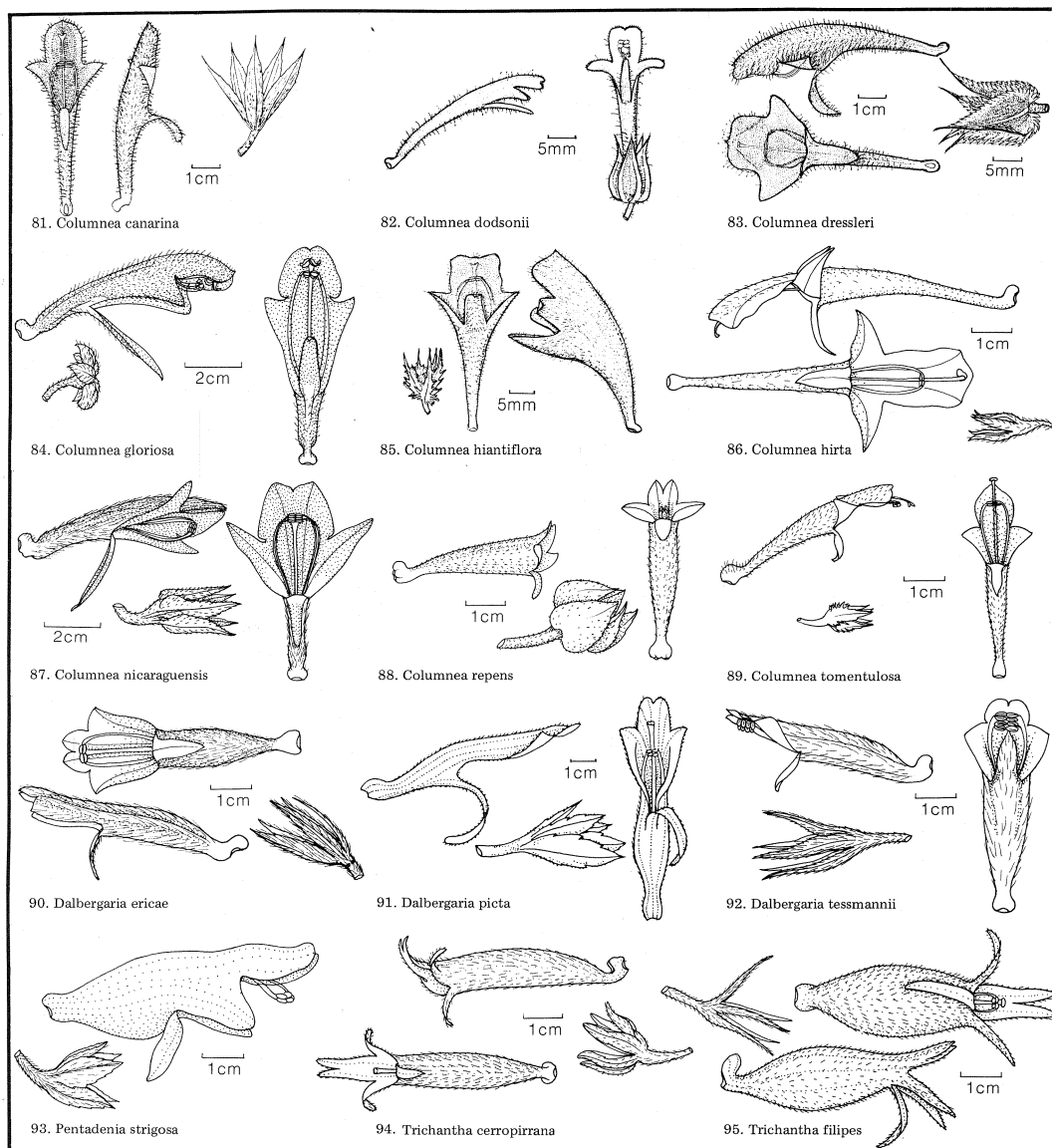


PLATE 5: ORNITHOPHILOUS FLOWERS IN SPECIES
OF NEOTROPICAL GESNERIACEAE: THE COLUMNEOID COROLLA

Figures 81-95

(Typical corolla colors: red, orange, or bright yellow)

81. *Columnea canarina* Wiehler, W-2264; 82. *C. dodsonii* Wiehler, W-1500; 83. *C. dressleri* Wiehler, W-2266; 84. *C. gloriosa* Sprague 'Santa Fé'; 85. *C. hiantiflora* Wiehler, W-2268; 86. *C. hirta* Klotzsch & Hanst., G-84; 87. *C. nicaraguensis* Oersted, W-1929; 88. *C. repens* (Hooker) Hanst., G-920; 89. *C. tomentulosa* Morton, W-1740; 90. *Dalbergaria ericae* (Mansf.) Wiehler, W-2278; 91. *D. picta* (Karsten) Wiehler, W-1150; 92. *D. tessmannii* (Mansf.) Wiehler, W-2272; 93. *Pentadenia strigosa* (Benth.) Hanst., Luer et al. 1662 (SEL); 94. *Trichantha cerropirrana* Wiehler, W-2458 (with mature corolla); 95. *T. filipes* (Oliver) Wiehler, Luer s.n., 1978 (SEL).

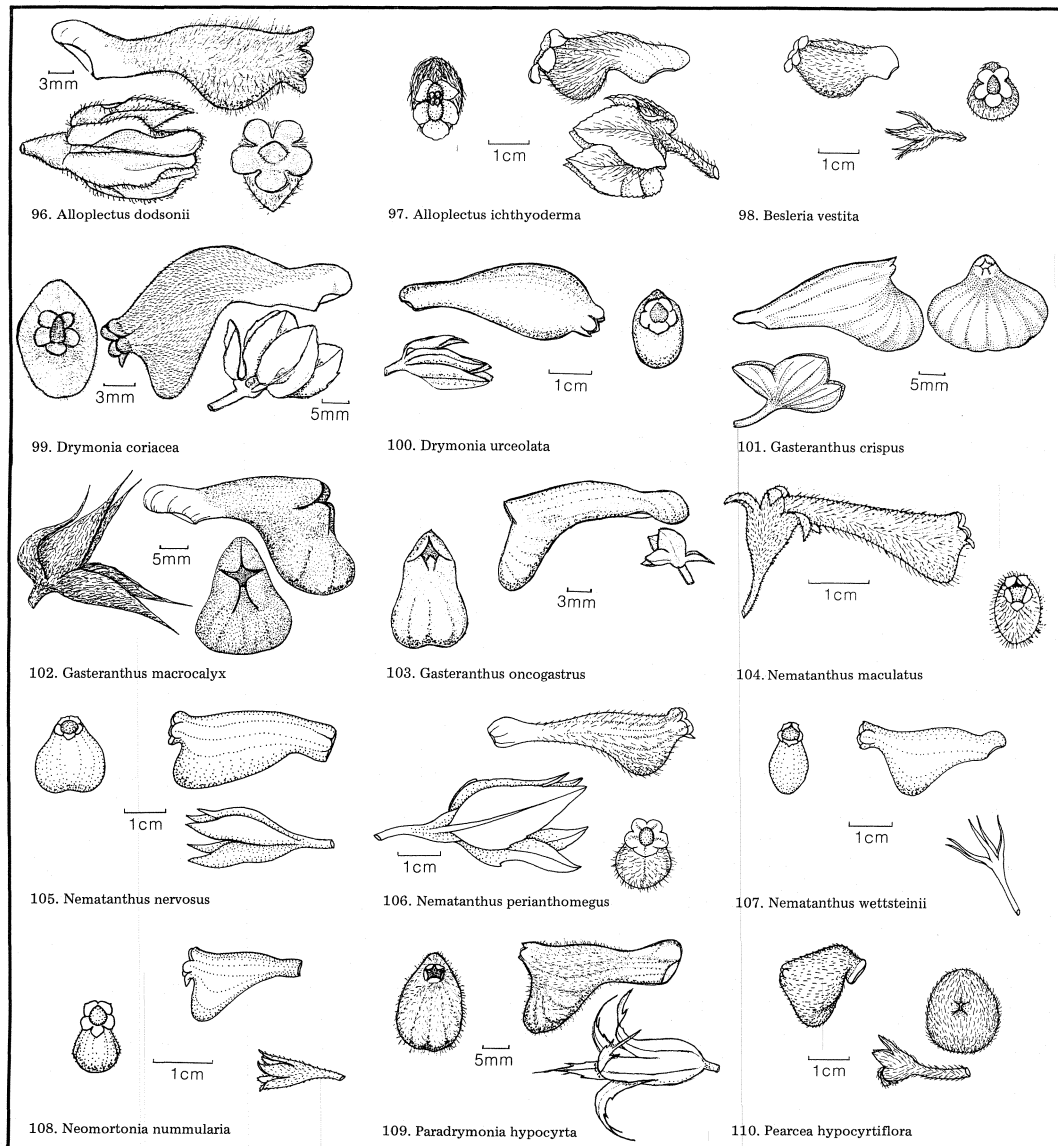


PLATE 6: ORNITHOPHILOUS FLOWERS IN SPECIES
OF NEOTROPICAL GESNERIACEAE:
THE HYPOCYRTOID AND URCEOLATE COROLLA

Figures 96-110

(Typical corolla colors: red, orange or bright yellow)

96. *Alloplectus dodsonii* Wiehler, W-1124; 97. *A. ichthyoderma* Hanst., Wiehler & Steyermark 72585 (SEL); 98. *Besleria vestita* Fritsch, Wiehler et al. 72154 (SEL); 99. *Drymonia coriacea* (Oersted) Wiehler, *Dodson s.n.*, 1971 (SEL); 100. *Drymonia urceolata* Wiehler, W-2222; 101. *Gasteranthus crispus* (Mansf.) Wiehler, W-1105; 102. *G. macrocalyx* Wiehler, *Madison 3806* (SEL); 103. *G. oncogastrus* (Hanst.) Wiehler, *Wiehler 7111* (SEL); 104. *Nematanthus maculatus* (Fritsch) Wiehler, W-2494; 105. *N. nervosus* (Fritsch) H. E. Moore, G-734; 106. *N. perianthomegus* (Vell.) H. E. Moore, W-1718; 107. *N. wettsteinii* (Fritsch) H. E. Moore, G-655; 108. *Neomortonia nummularia* (Hanst.) Wiehler, W-1966; 109. *Paradrymonia hypocyrta* Wiehler, W-2246; 110. *Pearcea hypocyrtiflora* (Hooker) Regel, W-1151.

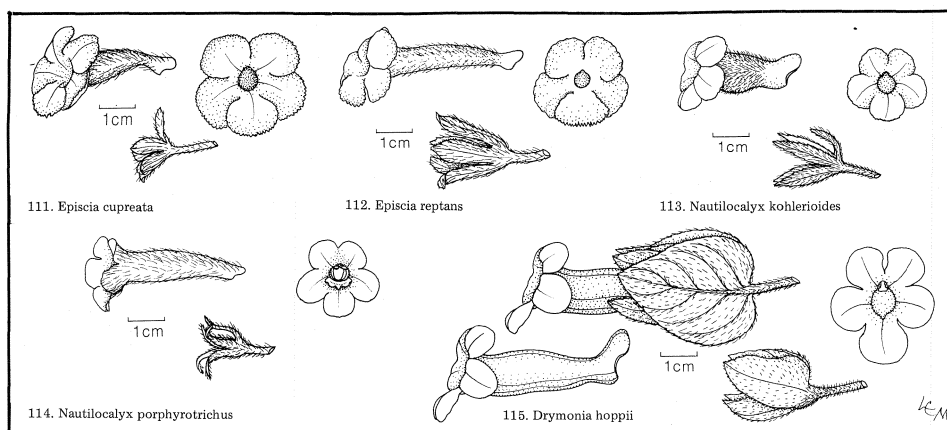


PLATE 7: ORNITHOPHILOUS FLOWERS IN SPECIES
OF NEOTROPICAL GESNERIACEAE:
THE CONVERTED RED EUGLOSSINE COROLLA

Figures 111-115

111. *Episcia cupreata*, W-2561; 112. *E. reptans* 'Utrecht'; 113. *Nautilocalyx kohlerioides*, Egler & Irwin 46400 (NY); 114. *N. porphyrotrichus* 'El Blanco'; 115. *Drymonia hoppii* (Mansf.) Wiehler, W-1588.

A study of *Episcia* sensu lato in field work, in the greenhouse, and in the herbarium makes it abundantly evident that the discordant taxa contained in the unwieldy genus are held together only by their common euglossophilous flowers. The lack of diversity of basic flower shapes in the numerous species attributed to *Episcia* and in related genera contrasts sharply with the variation in corolla forms present in other taxa of the tribe Episcieae and the subfamily Gesnerioideae. The clue to this puzzling general uniformity in corolla shapes in the *Episcia* complex lies probably in the large number of diverse Euglossine bees available as flower-specific pollen vectors. With the few exceptions of ('recent?') conversions to ornithophily and psychophily, floral evolution in this group of neotropical plants has developed in the direction of gynandro-euglossine pollination. The percentage of gynandro-euglossine pollination within the neotropical flora is unknown at present, but the relationship between the episciod plant genera and the euglossine bee genera represents an interesting example of successful co-evolution and symbiosis among neotropical groups of organisms. The occurrence of a fairly uniform floral structure in the *Episcia* complex does not indicate, however,

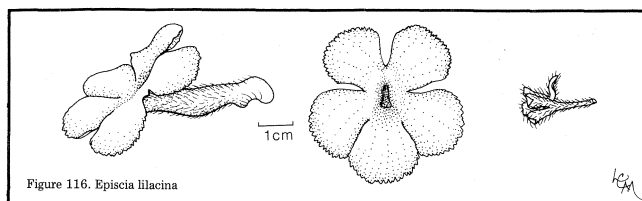


Figure 116. *Episcia lilacina* 'Bronze Leaf.' The only known case of psychophily in the *Episcia* complex. The large limb of the corolla of this cultivar, selected from the wild, is violet-blue (R. H. S. Colour Chart: Violet-Blue Group 91A), and the base of the key-hole entrance is bright yellow. The geographical variations in corolla color of this species range from pure white to pinkish, lilac, and violet-blue, and the leaves vary from population to population from light green to bronze purple, or they may be polychromatic.

that the large number of species with such flower forms are closely related or even congeneric: this is just another case of parallel or convergent evolution.

In fact, our present-day information on the nature of the genera in the tribe Episcieae indicates that *Episcia* sensu lato consists of groups of genera not at all closely related. The new generic delimitations are easily discernible with a shift of emphasis from floral to vegetative characters. When the unwieldy *Episcia* complex is separated according to vegetative characters, four natural groupings become apparent:

KEY TO THE EPISCIOID GENERA

1. Plants stoloniferous, with a sympodial shoot pattern.
 2. Plants terrestrial or saxicolous, typically with two stolons per node (Plate 8). Adaxial epidermis cells consisting of one layer of regular cells. (South America to Nicaragua). **Episcia sensu stricto**
6 species
 2. Plants strictly epiphytic, typically with one stolon per node in alternating leaf axils, the successive stolons giving the appearance of a single pendent stem with numerous plantlets in a series (Plate 8). Adaxial epidermis cell enlarged as water storage tissue or consisting of a multiple layer (= hypodermis). (Costa Rica to Mexico). . . **Alsobia**
2 species
1. Plants without stolons, with a monopodial shoot pattern.
 3. Plants epiphytic, vining, or terrestrial. Plant habit typically rosette-like, with leaves surpassing the stem, or the vining stem suffrutescent and firm. (South & Central America to Mexico) **Paradrymonia**
40+ species
 3. Plants strictly terrestrial, with soft and succulent, erect, ascending, or creeping stems, rarely forming loose rosettes. (South & Central America and Lesser Antilles). **Nautilocalyx**
50+ species

These four genera appear to be just as closely or distantly related one to another as to the rest of the genera of the tribe. In fact, there is probably a closer genetic relationship between *Nautilocalyx* and the revised genus *Alloplectus* (Wiehler, 1973: 379), than between *Episcia* sensu stricto and either *Alsobia*, *Nautilocalyx* or *Paradrymonia*. The hybridization data supports the new generic divisions and has been published earlier (Wiehler, 1976). In spite of numerous attempts by the author and other persons, no hybrids have been established between *Episcia* sensu stricto and *Alsobia*, or between *Episcia* and *Paradrymonia*, or *Episcia* and *Nautilocalyx*. Partially fertile interspecific hybrids within *Episcia* (involving *E. cupreata*, *E. lilacina*, and *E. rep-tans*) are offered in the commercial trade.

EPISCIA

Episcia Mart., emend. Wiehler.

Herbae terrestres vel saxatiles stoloniferae, vulgo stolonibus per nodum
doubus.

Episcia Mart., Nov. Gen. & Sp. Pl. 3:39. 1829.

Centrosolenia Benth., London J. Bot. 5:362. 1846.

TYPE SPECIES: *C. hirsuta* Benth., ibidem

Episcia sect. *Centrosolenia* (Benth.) Benth., in Benth. & Hook., Gen. Pl.
2:1007. 1876.

Episcia sect. *Episcia* subsect. *Centrosolenia* (Benth.) Lwbg., Acta Bot. Neerl. 7:310. 1958.

Episcia sect. *Episcia* subsect. *Trematanthera* Lwbg., ibidem.

Cyrtodeira Hanst., Linnaea 26:207. 1854.

TYPE SPECIES: *C. cupreata* (Hook.) Hanst., ibidem

TYPE SPECIES: *E. reptans* Mart.

ETYMOLOGY: From the Greek *epi*- = upon, on, over, (in), and *skia* = shade, referring to (plants found) in the shade.

1. *Episcia cupreata* (Hook.) Hanst., Linnaea 34: 340. 1865. (Figure 111)

Achimenes cupreata Hook., Bot. Mag. 73:5. 4312. 1847.

Cyrtodeira cupreata (Hook.) Hanst., Linnaea 26:207. 1854.

Cyrtodeira cupreata var. *metallica* Regel, Gartenflora 18:65, pl. 607. 1869.

Cyrtodeira cupreata var. *viridifolia* Hook., Bot. Mag. 86:t. 5195. 1860.

Episcia cupreata var. *viridifolia* (Hook.) Nichols., Illust. Dict. Gardening 1:517. 1885.

Tapina splendens Linden, Cat. 1857, and ex Galeotti, J. Hort. Prat. Belgique n.s. 1:97, pl. 9. May 1857.

Episcia splendens (Linden) Hanst., Linnaea 34:341. 1865.

Cyrtodeira trianae Hanst., Berliner Allg. Gartenzeitung 25:237. July 1857.

Tapina variegata Linden, Cat. 1867, and Belgique Hort. 17:105. 1867.

TYPE: *Purdie* 470 (HOLOTYPE: K).

DISTRIBUTION: Brazil: Amapá; Venezuela; Colombia; Panama.

This species is variable in leaf color (even within the same population) and corolla size.

2. *Episcia fimbriata* Fritsch, Bot. Jahrb. Syst. 37: 484. 1906. (Figure 20)

TYPE: *Ule 18b* (HOLOTYPE: if at B, then destroyed in war; if at HBG, then removed for safe-keeping during the war, confiscated afterwards by the Russians, and not yet returned to HBG).

DISTRIBUTION: Brazil: Acre, Mato Grosso; Peru: Loreto, Junin, Cuzco.

3. *Episcia hirsuta* (Benth.) Hanst., Linnaea 34: 350. 1865. (Figure 21)

Centrosolenia hirsuta Benth., London J. Bot. 5:362. 1846.

Episcia cordata Gleason, Bull. Torrey Bot. Cl. 58:466. 1931.

TYPE: *Schomburgk s.n.* (HOLOTYPE: K).

DISTRIBUTION: Venezuela: Amazonas, Guianas; Brazil: Rio Branco, Amapa.

This species produces stolons in its natural habitat, but none in the few collections recently brought into cultivation.

4. *Episcia lilacina* Hanst., Linnaea 34:342. 1865. (Figure 116)

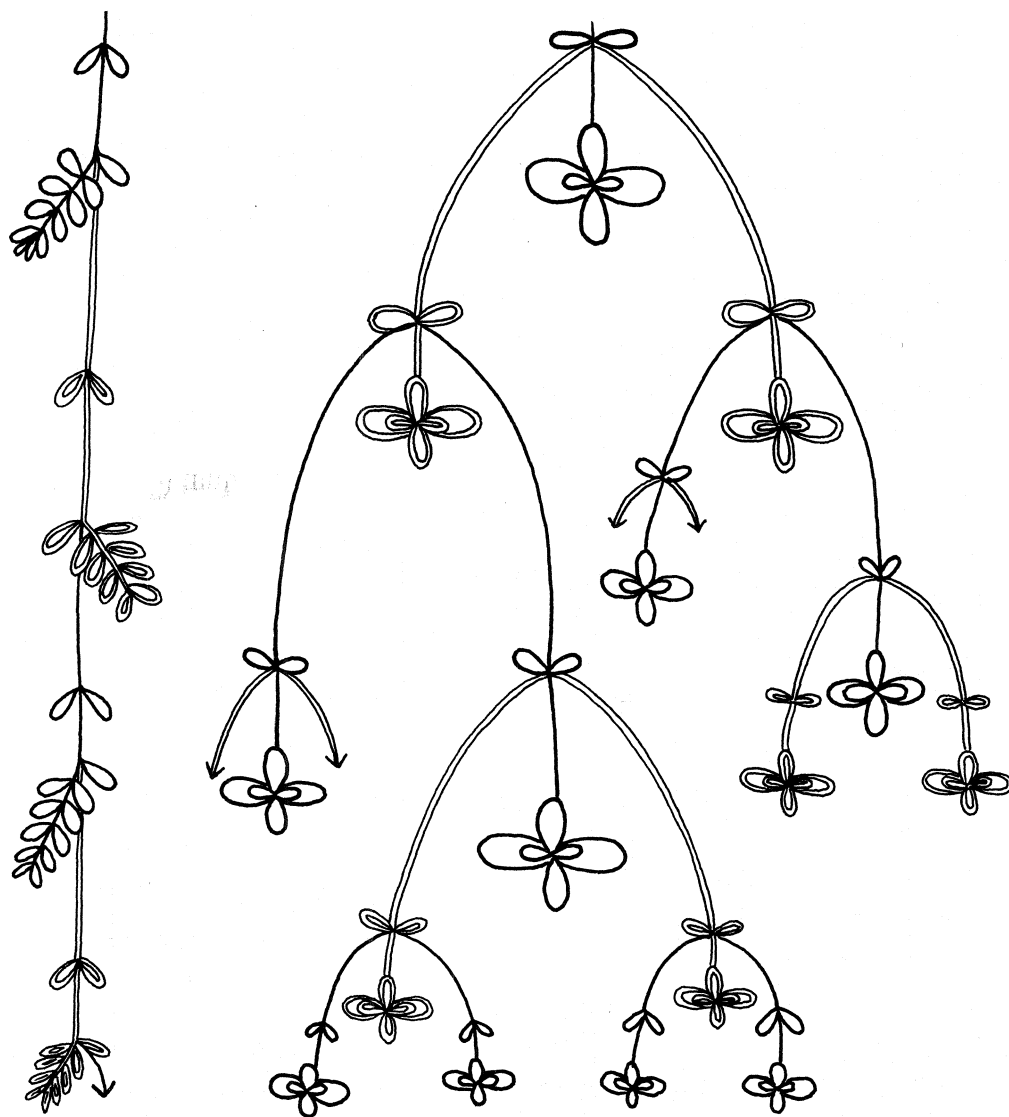
Cyrtodeira chontalensis Seem., Gard. Chron. 27: 655. 1867.

Episcia chontalensis (Seem.) Hook. f., Bot. Mag. 97:t. 5925. 1871.

Episcia fendleriana Kuntze, Rev. Gen. Pl. 2:473. 1891.

Episcia acaulis Donn. Sm., Bot. Gaz. (Crawfordsville) 61:378. 1916.

TYPE: *Wendland* 782 (HOLOTYPE: not at GOET or B; if at B, then destroyed in 1943).



ALSOBIA
Each stolon plantlet
produces only one
new stolon per node.

EPISCIA
A pair of new stolons
is produced per node.

Each change from single to double lines represents a new shoot generation.

PLATE 8: SCHEMATIC DRAWING OF DIFFERENCES
IN SYMPODIAL SHOOT GROWTH OF STOLONS IN *ALSOBIA* AND *EPISCIA*

DISTRIBUTION: Colombia: Antioquia, Chocó; Panama, Costa Rica, Nicaragua.

5. *Episcia reptans* Mart., Nov. Gen. & Sp. Pl. 3:41, (Figure 112)
t.217. 1829.

Cyrtodeira fulgida Linden, Cat. 90:5. 1873, and ex André, Ill. Hort. 20:
107, pl. 131. 1973.

Episcia fulgida (Linden) Hook. f., Bot. Mag. 100:t. 6136. 1874.

TYPE: *Martius 3091* (LECTOTYPE: M).

DISTRIBUTION: Colombia: Antioquia, Santander, Cundinamarca, Meta, Vau-
pes, Putomayo; Venezuela: Merida, Bolivar; Guianas; Brazil: Amazonas,
Rio Branco, Minas Gerais; Peru: Loreto.

Like *E. cupreata*, this species is variable in leaf color and corolla size.

6. *Episcia sphalera* Lwbg., Acta Bot. Neerl. 7:310, (Figure 22)
413, fig. 27. 1958.

TYPE: *Kappler 2044* (HOLOTYPE: P; ISOTYPE: GOET, RO, W).

DISTRIBUTION: Guianas; Brazil: Amapá; Pará.

This is the only species of the genus *Episcia* not yet in cultivation.

ALSOBIA

Alsobia Hanst., emend. Wiehler

Herbae epiphyticae stoloniferae, vulgo stolone per nodum uno.

Alsobia Hanst., Linnaea 26:207 (179, 180). 1854.

Episcia Mart., sect. *Alsobia* (Hanst.) Benth., in Benth. & Hook. f., Gen. Pl.
2:1006. 1876; Fritsch, in Engler & Prantl, Natl. Pflanzenfam. 4(3b):
166. 1894.

Episcia sect. *Episcia*, subsect. *Alsobia* (Hanst.) Lwbg., Acta Bot. Neerl.
7:309. 1958.

TYPE SPECIES: *Alsobia punctata* (Lindl.) Hanst.

ETYMOLOGY: The first part of *Alsobia* comes from the Greek *alsos*, forest;
the origin of the second part is obscure.

1. *Alsobia dianthiflora* (H. E. Moore & R. G. Wilson) (Figure 18)
Wiehler, comb. nov.

Episcia dianthiflora H. E. Moore & R. G. Wilson, Gentes Herbarum
8(5):379. 1954.

TYPE: *H. E. Moore 6824* (HOLOTYPE: BH).

DISTRIBUTION: Costa Rica: Guanacaste; Mexico: Guerrero.

The presence of this species in Costa Rica was recently established by
John Hall (s.n., SEL). It is otherwise known only from the type collection in
Mexico. Both collections are in cultivation at SEL.

2. *Alsobia punctata* (Lindl.) Hanst., Linnaea 26:207. 1854. (Figure 19)

Drymonia punctata Lindl., Bot. Reg. 28: misc. 63. 1842. Bot. Mag.
70:t. 4089. 1844.

Episcia punctata (Lindl.) Hanst., Linnaea 34:342. 1865.

Columnnea septentrionalis Morton, Bailey 15:119. 1967.

TYPE: *Harweg W-1103* (HOLOTYPE: CGE; CLONOTYPE: *Hort. Kew.*, 1843: K).

DISTRIBUTION: Guatemala: Baja Verapaz: Mountains of Salamá (Type locality, Aug. 1842). Mexico: Oaxaca, Jalisco. This species is known from only 4 collections, 3 of them made in Mexico in 1949 and 1961.

2a. *Alsobia* hybrid 'Cygnet,' *Gloxinian* 17(5):6. 1967. Cross of the two species above made by Dr. R. E. Lee in 1967. Hybrid pollen stainability 76%.

NAUTILOCALYX

Nautilocalyx Linden ex Hanst., emend. Wiehler

Herbae semper terrestres, caulibus succulentis erectis ascendentibus vel repentibus, foliis raro rosulatis.

Nautilocalyx Linden ex Hanst., *Linnaea* 26:207. 1854. Linden Cat. 1851, p. 12. Linden's catalogue has not yet been rediscovered.

Episcia Mart., sect. *Nautilocalyx* (Hanst.) Benth., in Benth. & Hook. f., Gen. Pl. 2:1007. 1876.

Skiophila Hanst., *Linnaea* 26:207. 1854.

TYPE SPECIES: *S. melittifolia* (L.) Hanst., ibidem.

Episcia sect. *Skiophila* (Hanst.) Benth., in Benth. & Hook. f., Gen. Pl. 2:1007. 1876.

Physodeira Hanst., *Linnaea* 26:207. 1854.

TYPE SPECIES: *P. bicolor* (Hook.) Hanst., ibidem.

Episcia subgen. *Physodeira* (Hanst.) Hanst., *Linnaea* 34:399. 1865.

Episcia sect. *Physodeira* (Hanst.) Benth., in Benth. & Hook. f., Gen. Pl. 2:1007. 1876.

Episcia sect. *Episcia* subsect. *Physodeira* (Hanst.) Lwbg., *Acta Bot. Neerl.* 7:309. 1958.

Episcia sect. *Trichosperma* Lwbg., *Acta Bot. Neerl.* 7:312. 1958.

Episcia sect. *Tarachanthus* Lwbg., ibidem, p. 313.

Episcia sect. *Episcia* subsect. *Centrosolenia* (Benth.) Lwbg., ibidem, p. 310, pro parte.

TYPE SPECIES: *Nautilocalyx hastatus* Linden ex Hanst. [= *N. bracteatus* (Planch.) Sprague]

ETYMOLOGY: From the Greek *nautilus* = sailor, or a reference to the mollusk genus *Nautilus* with its spirally chambered shells; and the Greek *kalyx* ("chalice"), the usually green and leafy part of a flower consisting of sepals. A somewhat obscure reference to the shape of the calyx in the type species or to the boat-like shape of the large bracts surrounding the inflorescence.

There are over 50 species in the genus, many of them undescribed. All species presently recognized are listed below.

1. **Nautilocalyx adenosiphon** (Lwbg.) Wiehler, comb. nov. (Figure 23)
Episcia adenosiphon Lwbg., *Acta Bot. Neerl.* 18(5):858. 1969.

TYPE: Cult. material of *Steiermark* 88162 [HOLOTYPE: WAG; ISOTYPES: VEN, WAG; clones of the HOLOTYPE: BH, SEL). The plants presently in cultivation in the United States are clones of the type material.

DISTRIBUTION: Venezuela: Bolivar.

2. **Nautilocalyx aeneus** (Linden & André) Wiehler, comb. nov. (Figure 24)

Centrosolenia aenea Linden & André, Ill. Hort. 22:168. 1875.

TYPE: *Roezl s.n.* (HOLOTYPE: ?).

DISTRIBUTION: Colombia: locality of type collection unknown; a recent collection, now in cultivation, comes from the Province of Antioquia.

3. *Nautilocalyx bicolor* (Hooker) Wiehler, comb. nov.

Episcia bicolor Hook., Bot. Mag. 74:t. 4390. 1848.

Physodeira bicolor (Hook.) Hanst., Linnaea 26:207. 1854.

TYPE: *Purdie s.n.* (HOLOTYPE: K; ISOTYPE: P).

DISTRIBUTION: Colombia: locality unknown; only known from the type collection.

4. *Nautilocalyx bracteatus* (Planch.) Sprague, Kew Bull. 1912:88.

Centrosolenia bracteata Planch., Fl. Serres Jard. Eur. 6:322. 1851.

Centrosolenia bractescens Hook., Bot. Mag. 78:5. 4675. 1852.

Episcia bractescens (Hook.) Hanst., Linnaea 34:351. 1865.

Nautilocalyx hastatus Linden ex Hanst., Linnaea 26:207, pl. 2, fig. 44. 1854; Linden Cat. 6:12. 1851 (nomen nudum).

TYPE: *Schlim 1714* (HOLOTYPE: ?; ISOTYPE: LE).

DISTRIBUTION: Colombia: Norte de Santander. Only known from the type collection.

5. *Nautilocalyx bryogeton* (Lwbg.) Wiehler, comb. nov.

Episcia bryogeton Lwbg., Acta Bot. Neerl. 7:312. 1958.

TYPE: *Pinkus 12* (HOLOTYPE: NY; ISOTYPE: US).

DISTRIBUTION: Guyana.

6. *Nautilocalyx bullatus* (Lem.) Sprague, Kew Bull. 1912:89. (Figure 25)

Centrosolenia bullata Lem., Ill. Hort. 16:t. 607. 1869.

Episcia tessellata hort. ex Lem., ibidem.

TYPE: *G. Wallis s.n.* (HOLOTYPE: ?). REPRESENTATIVE COLLECTION: *Ule 6279* (HBG, K) from near the type locality.

DISTRIBUTION: Peru: Loreto: Yurimaguas.

The collection presently in cultivation in the United States (since before 1957, BH and SEL greenhouse acc. no. G-132) is of unknown origin, but agrees with the type illustration.

7. *Nautilocalyx cataractarum* Wiehler, Selbyana 1(2):165-167, fig. 1. 1975.

TYPE: *Wiehler 75159* (HOLOTYPE: US; ISOTYPES: VEN, NY, SEL).

DISTRIBUTION: Venezuela: Bolivar.

The plants recently introduced into cultivation are clones of the type collection.

8. *Nautilocalyx colombianus* Wiehler, Selbyana 2(1):113, (Figure 26)
Plate 32:C. 1977.

TYPE: *Wiehler & Dressler 71160* (HOLOTYPE: SEL; ISOTYPES: BH, COL, F, MO, NY, PMA, US).

DISTRIBUTION: Northern Colombia and Panama.

The plants recently introduced into cultivation are clones of the type collection.

9. *Nautilocalyx decumbens* (Mart.) Wiehler, comb. nov.

Episcia decumbens Mart., Nov. Gen. & Sp. Pl. 3:40, tab. 212. 1829.

TYPE: *Martius 3119* (HOLOTYPE: M).

DISTRIBUTION: Brazil: Amazonas. Known only from the type collection.

10. *Nautilocalyx dressleri* Wiehler, Selbyana 2(1):114, (Figure 27)
Plate 32:D. 1977.

TYPE: *Dressler 4258* (HOLOTYPE: SEL; ISOTYPE: MO).

DISTRIBUTION: Panama.

11. *Nautilocalyx ecuadoranus* Wiehler, sp. nov. (Plate 9:A)

N. pallido (Sprague) Sprague affinis, a quo imprimis differt foliis floribusque parvioribus, foliorum et calycum laminis non ciliatis, prophyllis perfoliatis, calyci lobis lanceolatis non subaequalibus, corollae lobis dorsalibus maculatis, et nectario glabro.

Terrestrial, perennial, somewhat succulent herb; stems underground somewhat thickened, tuber-like, shoots branching only at the base, upright, 25-35 cm tall, 6-13 mm in diam., tan, finely pubescent, the internodes $\frac{1}{2}$ -6 cm long; leaf pairs of equal size, the petiole 1-7 cm long, green or wine-red, puberulous, the lamina lanceolate-elliptic, 12-18 \times 3.5-5 cm, acuminate, irregularly dentate, obtuse at the base, somewhat bullate, shining, light green, deep bluish green or wine-red, and almost glabrous above, pale green or flushed with pink or wine-red and sericeous below, the lateral pairs of veins 5-9. Inflorescence an axillary cyme of 2-8 flowers, the peduncle short (2-3 mm long) or absent, the prophylls perfoliate, lanceolate, 2 \times 0.6 cm, entire, glabrous, the subtending bracts lanceolate, 10 \times 3 mm, entire, glabrous, the pedicels 1-1.6 cm long; calyx lobes lanceolate, unequal, the lateral and lower lobes 1.8-2.4 \times 0.7 cm, the posterior lobe smaller and narrower (1.5 \times 0.5 cm), all lobes acute, sparsely serrate or entire, weakly sericeous; bracts, pedicels, and calyx either light green, or flushed with pink, or wine-red; corolla oblique to horizontal in the calyx, 3.2-3.6 cm long, spurred, cream-white, sericeous, the lobes subequal, ca. 9 \times 9 mm, entire or slightly erose, the upper two lobes spotted, veined, or lined with maroon, with a prominent maroon-purple, grooved nectar-guide on the *upper* side of the tube inside, the whole tube inside with short, capitate glandular trichomes and another groove on the ventral side; stamens 4, included, the filaments adnate for 5 mm to the base of the corolla tube, ca. 2.5 cm long, glabrous, the anthers coherent into pairs, the anthers 2 \times 1 mm; ovary 3 mm long, sericeous, with the style ca. 2.5 cm long, pilose, the stigma stomatomorphic; nectary reduced to a double-connate, dorsal gland, 2.5 \times 1.3 mm, white, glabrous. Fruit a bivalved capsule; seeds rhomboid-spherical, 0.5 mm in diam., black, with fleshy funicles 2 mm long.

TYPE: *ECUADOR*: PASTAZA: Puyo, open woods near Río Pindo Grande, plants exposed to lots of sunlight, leaves green-blue above, flushed pink below, calyx maroon, 30 July 1971, *Wiehler 7150* (HOLOTYPE: SEL; ISOTYPES: NY, QCA, S, US).

DISTRIBUTION: Apparently endemic to eastern Ecuador, known only from the areas of Puyo (Pastaza) and Tena (Napo).

ADDITIONAL MATERIAL EXAMINED: *ECUADOR*: PASTAZA: near type locality, leaves medium green above, lighter green below, calyx green, 30 July 1971, *Wiehler 7151* (SEL), leaves dark green above, pale red below, calyx green with a pink flush, 30 July 1971, *Wiehler 7154a* (SEL); leaves medium green, flushed pink below, calyx light green with a wine-red flush, 31 July 1971, *Wiehler 7168* (SEL), area around Puyo, leaves and calyx light green, 26 Dec. 1974, *Dressler, Stevenson, & Williams s.n.* (SEL, QCA, S, US); Puyo, rivulet-shore in forest about 3 km E of village, ca. 900 m alt., 9 Feb. 1956, *Asplund 19302* (S); same area, forest about 2 km E of village, 9 Feb. 1956, *Asplund 19319, 19320* (S); Vera Cruz, forest, ca. 900 m alt., 18 Feb. 1956, *Asplund 19438* (S); Union Basí, 8 km SE of Puyo, slopes near river by foot-bridge, leaves purple-blue above, reddish below, calyx maroon, 1 Aug. 1971, *Wiehler 7186* (SEL); *NAPO*: wooded slope 3 km S of Tena, leaves medium green, flushed pink and purple below, calyx green, 4 Aug 1971, *Wiehler 7186b* (SEL).

Nautilocalyx ecuadoranus, *N. glandulifer*, *N. leticianus*, and *N. pallidus* share the same curious feature related to pollination strategy: the nectar-guide, presumably for some species of Euglossine bees, is on the dorsal side of the corolla tube. The description and illustration of *N. ecuadoranus* are based partially on live material of *Wiehler 7150, 7154*, and *Dressler et al. s.n.* in cultivation at SEL.

12. *Nautilocalyx forgetii* (Sprague), Sprague, Kew Bull. (Figure 28)
1912: 89.

Allopectus forgetii Sprague, Kew Bull. 1910: 383.

TYPE: *Cult. Hort. Kew.* from material collected by *Forget s.n.* (HOLOTYPE: K).

The collection presently in cultivation in the United States (BH and SEL greenhouse acc. no. G-133) is also of unknown origin, first cultivated in England at Kew before 1937; it is possible that it represents clonal material of the type collection.

DISTRIBUTION: Peru: locality unknown.

13. *Nautilocalyx glandulifer* Wiehler, sp. nov. (Plate 9:B)

Ex affinitate *N. ecuadorani* Wiehler, sed differt plantarum indumento pilosi-hirsuto vinoso, foliis oblanceolatis cordati-auriculatis, prophyllis non perfoliatis, et calycibus pilosis.

Small terrestrial, perennial, succulent herb; stems erect or decumbent, branching only at the base, to 20 cm long, ca. 5 mm in diam., the internodes 1.5-4 cm long, the whole plant body prominently pilose-hirsute, with multi-seriate wine-red-purple hairs; leaf pairs of equal size, the petiole 1-2 cm long, yellow-green, the lamina oblanceolate, crenate-undulate, cordate-auriculate, shining and coppery purple-green above, wine-red-purple below (R.H.S. Colour Chart: Red-Purple Group 59A), the lateral pairs of veins 6-8. Inflorescence an axillary cyme of 2-6 flowers, the peduncle 1 mm long or absent, the prophylls elliptic, yellow-green, 1.7 × 0.5 cm, the subtending bracts oblanceolate, 1.3-1.7 × 0.3 cm, bracts, pedicels, and calyces yellow-green, pedicels 0.9-1.2 cm long; calyx lobes lanceolate, unequal, the lateral and lower lobes 1.3-1.8 × 0.5-0.7 cm, the dorsal lobe smaller, ca. 1 × 0.3 cm, all

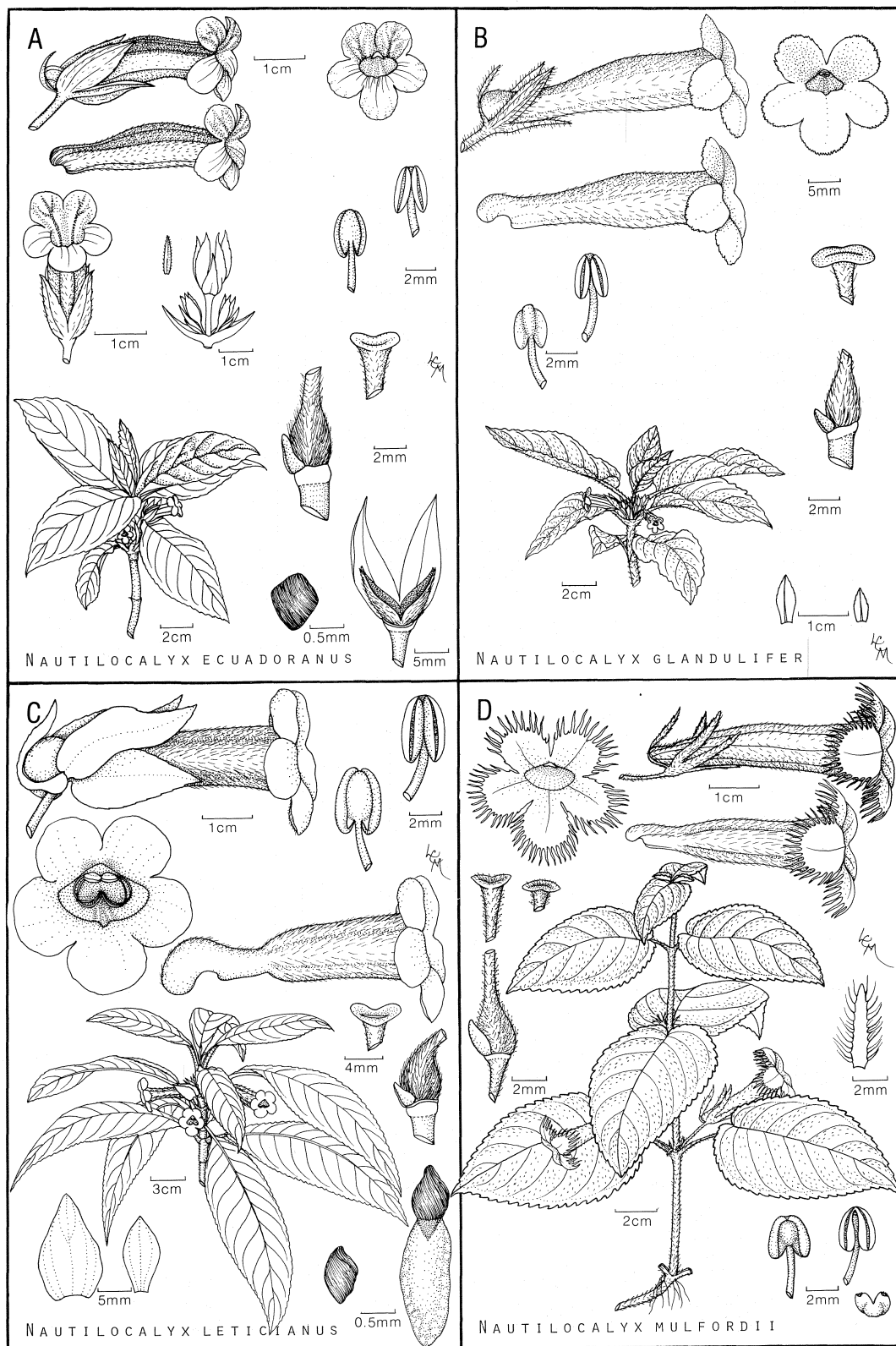


PLATE 9

lobes pilose outside, glabrous inside; corolla oblique in the calyx, 3.4-4.2 cm long, including a spur of 5 mm, cream-white, sericeous, the trichomes wine-red-purple, the lobes subequal, ca. 6×5 mm, erose, the upper 2 lobes speckled with maroon, the tube inside dorsally with a prominent maroon, grooved nectar-guide and short, capitate, glandular hairs, otherwise glabrous, with another groove on the ventral side; stamens 4, included, the filaments adnate for 4-5 mm to the base of the corolla tube, ca. 2.9 cm long, glabrous, the anthers coherent into pairs, each anther 2×1.2 mm; ovary 3 mm long, sericeous, with a pilose style 3-3.5 cm long and a stomatomorphic-bilobed stigma; nectary reduced to a prominent, double-connate, dorsal gland, 2.1×1.6 mm, white, glabrous. Fruit a bivalved capsule.

TYPE: *ECUADOR*: NAPO: woods on the western side of Tena, on rocks and by creek; original sterile collection 4 Aug. 1971, *Wiehler 7196* (SEL), clone from same collection cultivated at the SEL, 28 July 1977, *Wiehler 77130* (HOLOTYPE: SEL; ISOTYPES: BH, GH, K, MO, NY, QCA, S, SEL, U, US).

DISTRIBUTION: Apparently endemic to eastern Ecuador, known only from the type collection.

This low-growing, compact species with its shiny, coppery purple leaves has horticultural value and has been distributed to commercial growers. The epithet *glandulifer* (gland-bearing) refers to the many large, peltate, glandular trichomes found on the abaxial leaf surface of this species (Plate 10, Figure 119). The same unusual type of trichome with many head-cells and one stalk cell occurs also (but not as prominently) in *N. bullatus*, *N. ecuadoranus*, *N. leticianus*, *N. punctatus*, and *N. whitei* (Plate 10). All of these species are native to the Amazon basin. This type of trichomes has not been observed elsewhere in the Gesneriaceae and in other plant families (Wiehler, 1979), and its function is not yet understood.

14. *Nautilocalyx hirsutus* (Sprague) Sprague, Kew Bull. 1912: 89.

Alloplectus hirsutus Sprague, Kew Bull. 1911: 346.

TYPE: *Cult. Hort. Kew.* from material collected by *Forget s.n.* in Peru (HOLOTYPE: K).

OTHER REPRESENTATIVE MATERIAL: Brazil: Amazonas: Porvenir, on Rio Madeira, *Ule 9770* (K).

DISTRIBUTION: Peru: locality unknown.

15. *Nautilocalyx hirtiflorus* (Spruce ex Hanst.) Sprague, Kew Bull. 1912: 89.

Episcia hirtiflora Spruce ex Hanst., in Mart., Fl. Bras. 8(1):402. 1864.

TYPE: *Spruce 1037* (HOLOTYPE: K).

DISTRIBUTION: Brazil: Amazonas.

16. *Nautilocalyx kohlerioides* (Lwbg.) Wiehler, comb. nov. (Figure 113)

Episcia kohlerioides Lwbg., Acta Bot. Neerl. 13:61, fig. 2. 1964.

TYPE: *Irwin et al. 48315* (HOLOTYPE: NY; ISOTYPES: U, US).

DISTRIBUTION: Brazil: Amapá.

17. *Nautilocalyx leticianus* Wiehler, sp. nov. (Plate 9:C)

A *N. ecuadorano* Wiehler, *N. glandulifero* Wiehler, et *N. pallido* (Sprague) Sprague caulibus crassis, foliorum lamina non nitida, duplicato-serrata, caly-

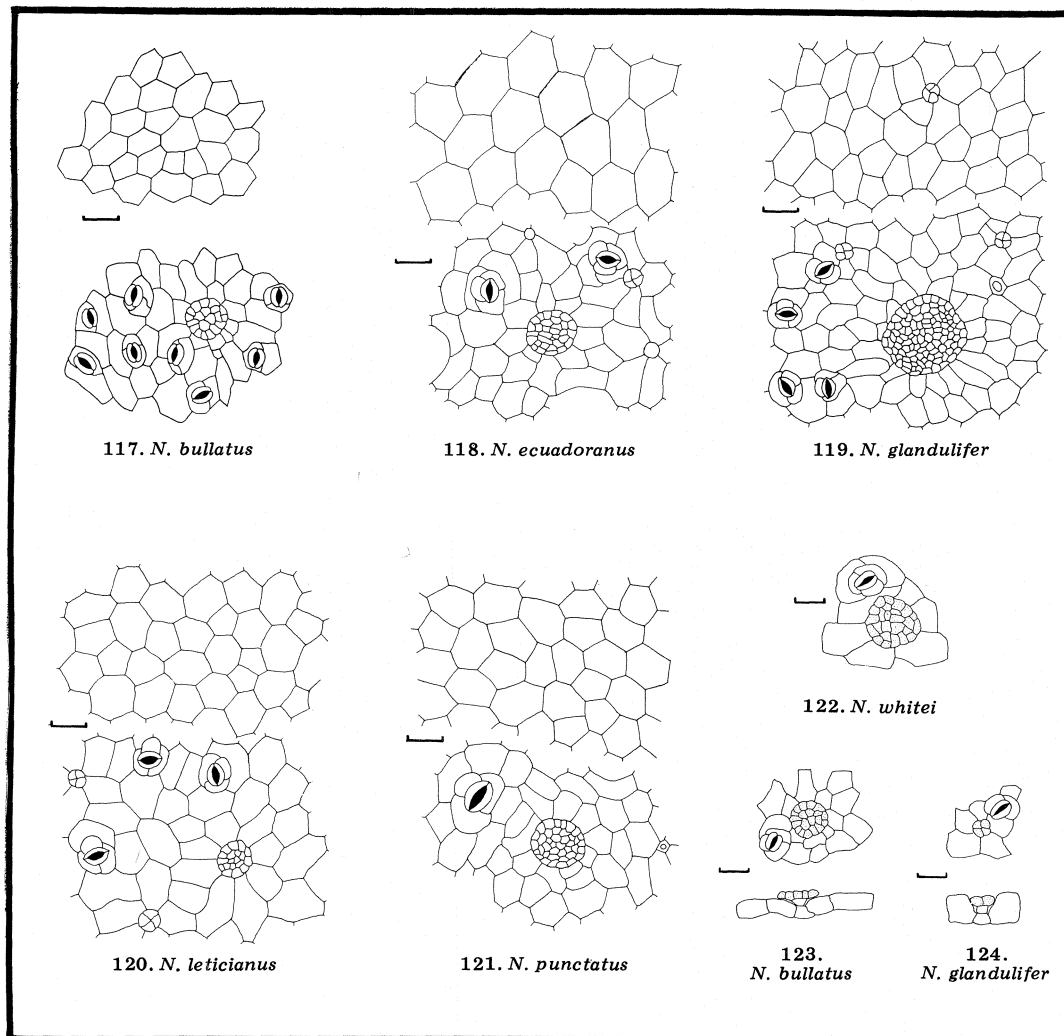


PLATE 10: UNUSUAL PELTATE GLANDULAR TRICHOMES
ON THE ABAXIAL SURFACE OF SPECIES OF *NAUTILOCALYX*

Figures 117-124

Figures 117-121: The camera lucida drawing above the scale (= 50 microns) represents the adaxial leaf epidermis, with the abaxial epidermis directly below. The mound-like shield of these small-celled, peltate, glandular trichomes often consists of more than 100 cells, in a single layer. The surrounding surface of the epidermis is somewhat depressed.

117. *Nautilocalyx bullatus* (Lem.) Sprague, G-132. The peltate trichomes in this species vary in size, but are fairly frequent. 118. *N. ecuadoranus* Wiehler, W-2037. Peltate trichomes comparatively rare. 119. *N. glandulifer* Wiehler, W-1537. Peltate trichomes large and abundant. 120. *N. leticianus* Wiehler, W-1995. Peltate trichomes rare. 121. *N. punctatus* Wiehler, W-1821. Peltate trichomes fairly frequent. 122. *N. whitei* Rusby, G-978, abaxial surface. 123. *N. bullatus*. Peltate trichome in top-view (above) and in cross-section (below), showing a single stalk cell. 124. *N. glandulifer*. Top-view (above) and cross-section (below) of a typical capitate, glandular trichome with four head cells, for comparison with Figure 123. The unusual peltate glandular trichomes in these species of *Nautilocalyx* are probably derived from the common capitate, glandular trichomes found in most species of Gesneriaceae.

cibus foliosis et corollis magnis facile distinguitur.

Terrestrial, perennial, succulent herb; the stems underground with small tubers, shoots branching only at the base, upright, 25-45 cm tall, 0.7-1.2 cm in diam., the young shoots reddish, the mature, lower parts of the stems tan, puberulous, the internodes 1-4 cm long; leaf pairs of equal size, the petioles 2-3 cm long, light green or flushed with pink, puberulous, the lamina elliptic, lanceolate, or oblanceolate, 19-25 × 6-9 cm, acuminate, doubly serrate, decurrent, the upper surface flat, not shining, light green, puberulous but appearing glabrous, the lower surface yellow-green, sparsely sericeous, the lateral pairs of veins 10-12. Inflorescence an axillary cyme of 2-8 flowers, the peduncle minute or absent, the prophylls ovate, 1.3-1.5 × 0.7-0.8 cm, acute, entire, glabrous, the similar subtending bracts 6 × 3 mm, the pedicels ca. 1.5 cm long, light green glabrous; calyx lobes broadly lanceolate, unequal, the lateral and lower lobes 2.4-2.7 × 1.5-1.7 cm, the posterior lobe smaller, ca. 2 × 1.3 cm, all lobes acute, sparsely serrate, almost glabrous; corolla oblique in the calyx, 4.8-6.1 cm long, prominently spurred, the tube cream-white, pilose, the lobes subequal, ca. 1 × 1.6 cm, entire, light yellow, almost glabrous outside, dotted with short glandular hairs inside, the tube within cream-white, covered by short glandular trichomes, with a dorsal and a ventral ridged groove and a dorsal purple-spotted nectar-guide; stamens 4, included, the filaments adnate for 10-12 mm to the base of the corolla tube, ca. 4.5 cm long, glabrous, the anthers coherent into pairs, each anther 3 × 2.8 mm; ovary 3 mm long, sericeous, with the style ca. 4.5 cm long, pilose, the stigma stomatomorphic; nectary reduced to a thick, double-connate, dorsal gland, 3.2 × 3 mm, white, glabrous. Fruit a bivalved capsule, seeds rhomboid-spherical, 0.5 mm in diam., brown, with a fleshy funicle 2.5 mm long.

TYPE: COLOMBIA: AMAZONAS: near Leticia. Seeds of terrestrial herb collected by R. L. Dressler in June, 1974 and sent to SEL; plants cultivated at SEL under acc. no. W-1995, first flowered in Sept. 1975; type specimens prepared 3 Nov. 1976, *Wiehler 76245* (HOLOTYPE: SEL; ISOTYPES: BH, COL, F, GH, K, MO, NY, S, SEL, US).

DISTRIBUTION: Known only from the type locality.

18. *Nautilocalyx lucianii* (Fournier) Wiehler, comb. nov.

Episcia lucianii Fournier, Ill. Hort. 23:43. 1876 ('*luciani*').

TYPE: No type specimen has been found to-date, and the type locality and first collector are unknown. The type illustration in Ill. Hort. is herewith designated as the lectotype.

DISTRIBUTION: Colombia. Recent collections include: Antioquia: *Uribe 1161* (US); Caldas: *Uribe 2600* (US). Fournier named this species for Lucien Linden of Ghent, Belgium.

19. *Nautilocalyx lynchii* (Hook. f.) Sprague,

(Figure 29)

Kew Bull. 1912: 89.

Alloplectus lynchii Hook f., Bot. Mag. 118:t. 7271. 1892.

TYPE: *Lynch s.n.*, cult. at Bot. Gard. Cambridge, received by Hooker from Mr. Lynch July 8, 1892 (LECTOTYPE: K). The collection presently in cultivation in the United States (BH and SEL greenhouse acc. no. G-288) is also of unknown origin, but can be traced back to Maurice Mason, King's

Lynn, Norfolk, England, first appearing in the United States somewhere before 1957. It appears to be clonal material of the type collection. No subsequent collection of *Nautilocalyx* from South America seems to match the type collection of *N. lynchii* (including *Humbert s.n.*, June 1959, at P, det. *N. lynchii* by Morton in 1967, photo at US).

DISTRIBUTION: origin and collector unknown; probably from Peru or Ecuador.

20. *Nautilocalyx melittifolius* (L.) Wiehler, *Phytologia* 27(5):307. 1973.

Besleria melittifolia L., *Sp. Pl.* 619. 1753.

Episcia melittifolia (L.) Mart., *Nov. Gen. & Sp. Pl.* 3:42. 1829.

Skiophila melittifolia (L.) Hanst., *Linnaea* 26:207. 1854.

Chrysothemis melittifolia (L.) G. Don, in Loudon, *Encycl. suppl.* 2: 1402. 1855.

Besleria guadalupensis DC., *Prodr.* 7:538. 1839.

Episcia guadalupensis (DC.) Hanst., *Linnaea* 34:345. 1865.

Episcia melittifolia var. *guadalupensis* (DC.) Urban, *Symb. Antill.* 2: 354. 1901.

Episcia melittifolia forma *guadalupensis* (DC.) Stehlé, *Bull. Soc. Bot. France* 109:32. 1962.

Chrysothemis venosa Decne., *Rev. Hort.* III 3:242. 1849.

TYPE: The publication of *Besleria melittifolia* by Linnaeus is based on a description of a plant from Martinique by Plumier in his *Nov. Pl. Amer. Gen.* 29, pl. 5. 1703, "*Besleria melissae*, tragi facie." Plumier left no herbarium, and since there is no clear indication of the species on his illustrated plates, Leeuwenberg (1958, p. 300) selected as a neotype for *Besleria melittifolia* L. a plate from a collection of more detailed drawings by Plumier published posthumously by Burmann as *Plant. Amer. Car.* Plumier in 1756, entitled: "*Besleria pedunculis ramosis*" (plate 48).

DISTRIBUTION: Lesser Antilles.

21. *Nautilocalyx membranaceus* (Morton) Wiehler, (Figure 30)
Phytologia 27(5):307. 1973.

Episcia membranacea Morton, *Acta Bot. Venez.* 1(2):72. 1966.

Drymonia paradisca Morton ined., ms. written in 1966, given to the author in 1970, but 'types' distributed to various herbaria previously (*Steyermark 91521*, from Rancho Grande).

TYPE: *Steyermark & Agostini 91171* (HOLOTYPE: US; ISOTYPES: VEN, K, US).

DISTRIBUTION: Venezuela: Sucre: Peninsula Paria; Aragua: Parque Nacional Henry Pittier (Rancho Grande).

22. *Nautilocalyx mimuloides* (Benth.) Morton, *Fl. Trinidad & Tobago* 2(5): 304. 1955.

Episcia? mimuloides Benth., *London J. Bot.* 5:362. 1846.

TYPE: *Schomburgk 843* (LECTOTYPE: K, cf. Leeuwenberg, 1958, p. 409).

DISTRIBUTION: Guianas and Tobago.

23. *Nautilocalyx mulfordii* Wiehler, sp. nov. (Plate 9:D)

Herba terrestris perennis aliquantum succulenta; caules repentes et decumbentes, saepe ad nodos radicales, ad 60 cm longi, 4-7 mm in diam., rosei, tomentosi, internodiis 2-5 cm longis; folia per paria subaequalia, petio-

lis 1-4 cm longis roseis tomentosis, laminis ovatis, 5-8 × 4-6 cm, apice acutis basim obtusis vel auriculatis, crenatis, supra bullatis utrinque viridibus parce pilosis subtus venis roseis sericeis, nervis secundariis 6-8. Inflorescentia cyma axillaris redacta, floribus 1-2, pedunculo destituto, prophyllis minutis subulatis 6-9 mm longis, pedicello 1-2 cm longo roseo tomentoso; calyx pallide viridis roseo-suffusus sericeus lobis subaequalibus 11-14 mm longis e basi discretis lanceolatis serratis; corolla in calyce obliqua tubaeformis calcarata, ca. 5.5 cm longa, alba sericea, lobis subaequalibus 9-15 mm longis et latis, fimbriatis, tubo intus glabro; stamina 4, inclusa, filamentis ca. 3 cm longis, basi cum tubo corollae adnatis, albis glabris, antheris per paria cohaerentibus, loculis lateraliter compressis, 1.1 × 0.5 mm, per totam longitudinem dehiscentibus; ovarium 4 mm longum sericeum, stylo ca. 2.5-3 cm longo glanduloso-piloso, stigmatibus stomatomorpho; nectarium glandula dorsalis duplo-connata, 2.2 × 2 mm, alba glabra. Fructus capsula bivalvis, semina ovoidea brunnea striata, 0.7 mm longa.

TYPE: BRAZIL: AMAZONAS: about 15 km W of Manaus, near the Río Negro; plants forming ground cover on hard clay soil in a clearing in humid forest; plants collected by M. R. Mulford around 1952; cultivated material known as *Episcia* 'Amazon White,' Selby and Cornell greenhouse acc. no. G-116, 5 April 1977, H. Wiehler 77105 (HOLOTYPE: SEL; ISOTYPES: BH, GH, IAN, INPA, K, MO, NY, SEL, U, US).

DISTRIBUTION: Known only from the type locality.

This species is named in honor of Mr. Marion R. Mulford, now a retired nurseryman residing at Altamonte Springs, Florida. From his former nursery in Ohio Mr. Mulford distributed many plants of horticultural merit, either field-collected or developed by him, among them *Peperomia* 'Emerald Ripple,' *Pilea* 'Moon Valley,' *P.* 'Dorothy Mulford,' *P.* 'Silvertree,' and *Aphelandra* 'Apollo.' Plants of *Nautilocalyx mulfordii* can be grown in hanging baskets.

24. *Nautilocalyx pallidus* (Sprague) Sprague, Kew Bull. 1912: 89; Bot. Mag. 139:t. 8519. 1913.

Alloplectus pallidus Sprague, Kew Bull. 1911: 346.

TYPE: *Forget s.n.* (HOLOTYPE: K). There appears to be a discrepancy between the type material and the numerous subsequent collections from the Amazon basin attributed to *N. pallidus*. The holotype shows leaves with a distinct pattern of venation, and the colored illustration of the type in Bot. Mag. t. 8519 shows the corolla with a unique purple-blotched nectar guide on the dorsal (!) side of the tube, a feature cited also in the original description. These characters are absent in most or all subsequent herbaria collections labelled *N. pallidus*.

DISTRIBUTION: Peru: locality of type collection unknown.

25. *Nautilocalyx panamensis* (Seem.) Seem., (Figure 31)
 Bot. Voy. Herald Suppl. 250. 1854.
Scheeria panamensis Seem., Bot. Voy. Herald 185. 1854.
Achimenes panamensis (Seem.) Hemsley, in Godman & Savin, Biol. Central-Amer., Bot. 2:475. 1882.
Episcia panamensis (Seem.) Morton, Acta Bot. Venez. 1(2):71. 1966.
Episcia inclinata T. S. Brandegee, Univ. Calif. Publ. Bot. 6:63. 1914.

TYPE: *Seemann 235* (HOLOTYPE: BM; ISOTYPE: K).

DISTRIBUTION: Colombia: Valle, Chocó, Antioquia, Magdalena, Norte de Santander; Panama: Darien, Panamá, Canal Zone; Mexico: Chiapas.

26. *Nautilocalyx peltatus* (Morton) Wiehler, comb. nov.

Episcia peltata Morton, J. Wash. Acad. Sci. 35(4): 131. 1945.

TYPE: *Metcalf & Cuatrecasas 30098* (HOLOTYPE: US).

DISTRIBUTION: Colombia: Antioquia.

27. *Nautilocalyx peruvianus* Wiehler, sp. nov.

(Plate 11:A)

Fortasse *N. forgetio* (Sprague) Sprague affinis, sed foliis longioribus, laminis non bicoloribus, bracteis pedicellis calycibusque glabris, corollis majoribus maculatis lobis luteis distinguendus.

Terrestrial, perennial, succulent herb with underground tuber; stems branching at base and nodes, upright, 20-30 cm tall, 8-12 mm in diam., light green or flushed with rose, sericeous, the internodes 1-4 cm long; leaf pairs of equal size, the petiole 5-10 mm long, light green or flushed with rose, sericeous, the lamina lanceolate-elliptic, 16-20 × 4-5 cm, acuminate, irregularly dentate, decurrent, flat, shining, medium green and glabrous above, pale green or flushed with rose and glabrous below, sericeous along the veins, the lateral pairs of veins 8-12. Inflorescences axillary cymes, with 4-6 flowers, the peduncles absent, the prophylls lanceolate, 1.7 × 0.6 cm, the subtending bracts similar, 1.1 × 0.3 cm, the pedicels 1-2 cm long, green, glabrous; calyx lobes lanceolate, unequal, the lateral and lower lobes ca. 2 × 0.9 cm, the posterior lobe smaller and narrower, 1.5 × 0.7 cm, all lobes acute, sparsely serrate, light green or flushed with rose, almost glabrous; corolla oblique in the calyx, ca. 4 cm long, the spur yellow and glabrous, the tube outside cream-white, sericeous, the limb-face light yellow (H.R.S. Colour Chart: Yellow Orange Group 16) and glabrous, the lobes subequal, ca. 6 × 8 mm, entire, the tube inside with wine-red lines and short, capitate-glandular trichomes, an area of wine-red spots deep inside dorsally, and a ridged groove on both the dorsal and ventral sides; stamens 4, included, the filaments adnate for 7 mm to the base of the corolla tube, ca. 3 cm long, the anthers coherent into pairs, each anther 2 × 1 mm; ovary 4 mm long, sericeous, with the style ca. 3 cm long, pilose, the stigma stomatomorphic-bilobed; nectary reduced to a double-connate, dorsal gland, 3 × 2 mm, white, glabrous. Fruit a bivalved capsule; seeds ovoid, 0.5 mm long, striate, with tan and brown lines, the fleshy funicle 2.5 mm long.

TYPE: *PERU*: HUANUCO: Finca Panguana, on Río Llullapichis, 1 hour walk from village of Llullapichis on Río Pachitea (ca. 9° 30' S, 74° 50' W), terrestrial herb; seeds collected by *R. L. Dressler* from plants of his collection 4932 (SEL), sown at SEL 18 March 1975, cultivated under acc. no. W-2129, type specimens prepared 27 May 1976, *H. Wiehler 76177* (HOLOTYPE: SEL; ISOTYPES: BH, F, GH, K, MO, NY, SEL, US, USM).

DISTRIBUTION: Known only from the type locality.

ADDITIONAL MATERIAL EXAMINED: *PERU*: HUANUCO: type locality: 25 Jan. - 15 Feb. 1975, *R. L. Dressler 4932* (SEL).

Pollination by female Euglossine bees of this yellow-flowered species has been observed by Dr. Dressler (personal communication).

28. *Nautilocalyx picturatus* L. Skog, Bailey (Figure 32)
19(3): 119. 1974.

TYPE: *Wurdack* 1996 (HOLOTYPE: US; ISOTYPE: BH).

DISTRIBUTION: Peru: Amazonas. Known only from the type collection. The plants presently in cultivation in the United States are from seed of the type collection.

29. *Nautilocalyx pictus* (Hook.) Sprague, Kew Bull. 1912: 88.
Centrosolenia picta Hook., Bot. Mag. 77:t. 4611. 1851.
Episcia picta (Hook.) Hanst., in Martius, Fl. Bras. 8(1): 403. 1864.
Nautilocalyx lacteus Sandwith, Kew Bull. 1931: 489.

TYPE: *Cult. Hort. Kew* from material sent by Spruce "from the banks of the Amazon." (HOLOTYPE: K).

DISTRIBUTION: Guianas; Brazil: Amazonas?; Amapá. There appear to be only minor differences between this species and *N. villosus*, including the obvious indumentum. Live material of *N. pictus* will be the necessary prerequisite to determine the relationship of these two species.

30. *Nautilocalyx porphyrotrichus* (Lwbg.) Wiehler, (Figure 114)
Phytologia 27(5):308. 1973.
Episcia porphyrotricha Lwbg., Acta Bot. Neerl. 7:311. 1958.

TYPE: *Davenport* 7 (HOLOTYPE: K).

DISTRIBUTION: Guyana; Venezuela: Bolivar. The material presently in cultivation in the United States comes from Cerro Venamo, Bolivar, Venezuela (Wiehler, Steyermark, & Wurdack 72420, 72425, 72440, SEL). I found plants with green or variegated leaves in the same populations, as well as plants covered with red indumentum and other plants only with clear-celled trichomes.

31. *Nautilocalyx punctatus* Wiehler, sp. nov. (Plate 11:B)

Ab affini *N. lynchio* (Hooker f.) Sprague foliis sericeis, calycum lobis majoribus lanceolatis exduplicativis corollis majoribus eburneis, lobis manifeste maculatis, antherarum thecis lateraliter compressis fere conduplicatis recedit.

Terrestrial, perennial, succulent herb; stems branching only at the base, upright, 25-60 cm tall, 1-1.5 cm in diam., young shoots light green flushed with rose, mature stems tan, sericeous, with wine-red trichomes, the internodes 1-4 cm long; leaf pairs usually of equal size or subequal, the petioles 0.3-1.1 cm long, light green flushed with rose, sericeous, the lamina oblanceolate, 15-25 × 4.5-9.5 cm, acuminate, serrate, decurrent, somewhat bullate, shining, coppery purple-green and sericeous above, reddish purple and sericeous below, all trichomes on the lamina wine-red, the lateral pairs of veins 8-10. Inflorescences axillary cymes with 4-8 flowers, the peduncles absent, the prophylls lanceolate, ca. 2.5 × 0.9 cm, light green with rose flush apically, the subtending bracts similar, ca. 1.5 × 0.4 cm, the pedicels 1-2.5 cm long, light green, sericeous; calyx lobes lanceolate, unequal, exduplicate (the margins bent abruptly outward, with the adaxial faces touching, see Plate 11:B), acuminate, serrate, light green flushed with rose, sparsely sericeous, the lateral and lower lobes ca. 2.5 × 1.1 cm, the posterior lobe ca. 1.9 × 1.0 cm; corolla oblique in the calyx, ca. 4.5 cm long, the spur yellow and glabrous,

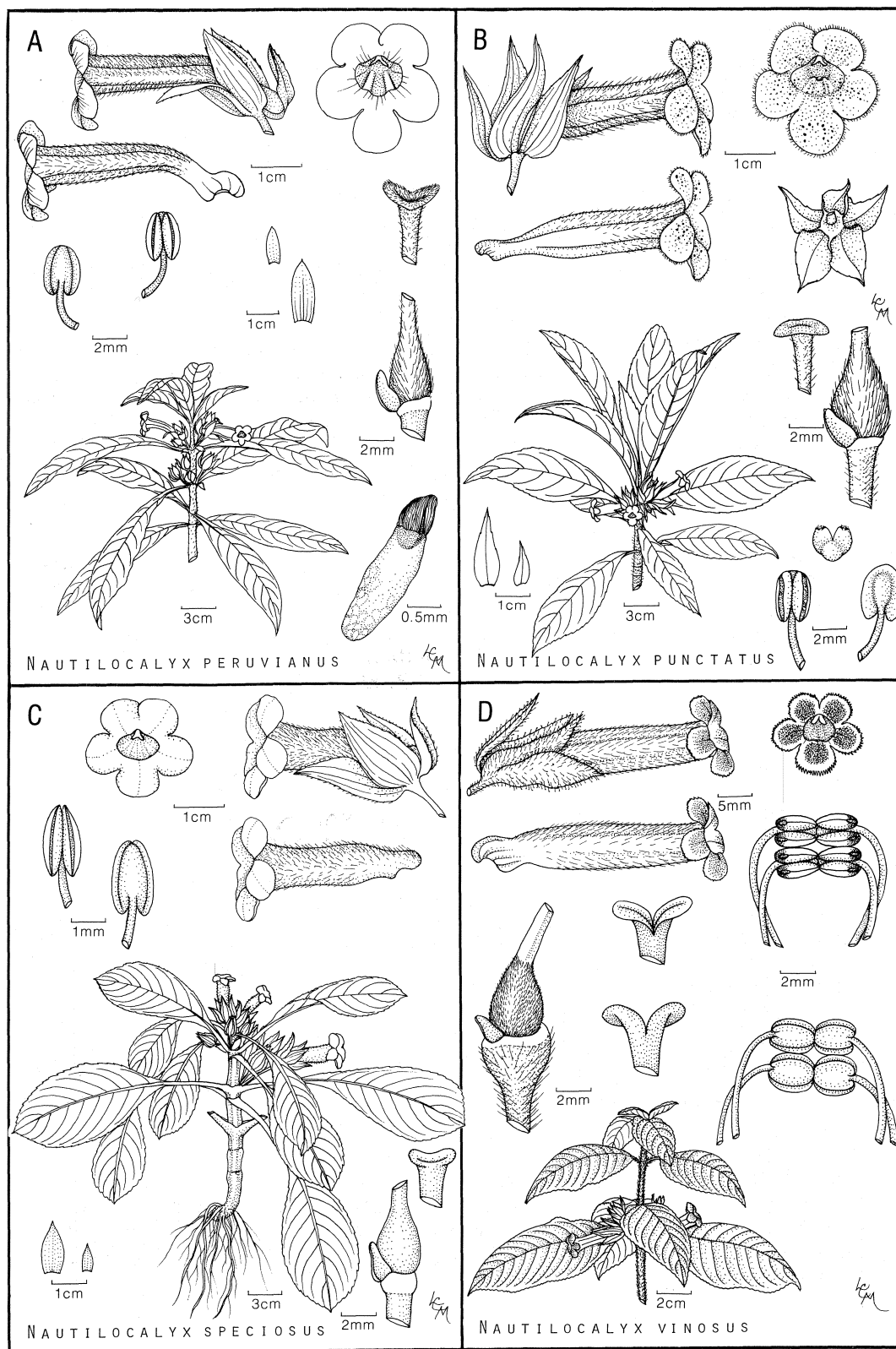


PLATE 11

the tube outside cream-white, sericeous, the limb cream-white, prominently spotted with wine-red, glabrous, the upper and lateral lobes subequal, ca. 7 × 12 mm, the lower lobe larger, ca. 11 × 13 mm, the tube within with a ridged groove on both the dorsal and ventral sides, the throat flushed with pale yellow, the distal part of the tube inside covered with wine-red dots, and the dorsal side furnished with short, capitate, glandular trichomes; stamens 4, included, the filaments adnate for 8 mm to the base of the corolla tube, ca. 3 cm long, white, glabrous, the anthers coherent into pairs, each anther 2.5 × 1.2 mm, the locules laterally compressed, with the walls of each locule almost conduplicate; ovary 4 mm long, sericeous, the style ca. 2.8 cm long, white, pilose and the stigma stomatomorphic-bilobed; nectary reduced to a double-connate, dorsal gland, 3 × 2 mm, white, glabrous. Fruit a bivalved capsule.

TYPE: *VENEZUELA*: TERRITORIO FEDERAL AMAZONAS: Cerro Yapacana, 3° 45' N, 66° 45' W, between base camp and Sabana Grande, 125 m alt., original collection 7 May 1970, *Steyermark & Bunting 103207* (VEN); live material of same collection cultivated at VEN, transferred in 1972 to SEL, acc. no. W-1821, type specimens prepared 28 July 1977 *Wiehler 77131* (HOLOTYPE: SEL; ISOTYPES: BH, K, MO, MY, NY, SEL, US, VEN).

DISTRIBUTION: Known only from southern Venezuela, but to be expected in neighboring territories of Brazil.

ADDITIONAL MATERIAL EXAMINED: *VENEZUELA*: TERRITORIO FEDERAL AMAZONAS: type locality, 7 May 1970, *Steyermark & Bunting 103207* (VEN); Sierra Parima, vicinity of Simarowochi, Río Matacuni, 3° 49' N, 64° 36' W, 6-7 km W of the Brazilian border, 795-830 m alt., 18 April - 23 May 1973, *Steyermark 107412* (SEL, VEN, both sterile).

This species has the same peculiar peltate trichomes on the abaxial leaf surface as described above (Plate 10:E).

32. *Nautilocalyx resioides* (Lwbg.) Wiehler, comb. nov.

Episcia resioides Lwbg., Acta Bot. Neerl. 13: 59. 1964.

TYPE: *Maguire & al. 53760* (HOLOTYPE: NY).

DISTRIBUTION: Venezuela: Bolivar.

33. *Nautilocalyx silvaticus* (Cuatrecasas) Wiehler, comb. nov.

Episcia silvatica Cuatrecasas, Trab. Mus. Nac. Ci. Nat., Ser. Bot. 29:12. 1935; ibidem. 33: 120-122, fig. 4. 1936.

TYPE: *Cuatrecasas 2046* (HOLOTYPE: MA).

DISTRIBUTION: Colombia: Tolima.

34. *Nautilocalyx speciosus* Wiehler, sp. nov.

(Plate 11:C)

Nulli arcte affinis. Inter species generis panamenses foliorum laminis adaxialibus glabris, calycibus foliosis, et corollis lilacini-maculatis valde differt.

Terrestrial, perennial, succulent herb; stems branching only at the base, erect, ca. 15-25 cm tall, ca. 8 mm in diam., rose-pink, young shoots and petioles sericeous, mature stems glabrous, the internodes 1-3 cm long; leaf pairs equal to subequal, the petioles 4-10 cm long, pink, glabrous on older leaves, the lamina oblanceolate, 9-13 × 4.5-6 cm, acuminate, serrate, decur-

rent, flat, medium green and glabrous above, pale green, sometimes flushed with pink, and sericeous below, the lateral pairs of veins 7-9. Inflorescence axillary cymes of 4-6 (or more) flowers, the peduncle 3-8 mm long, the prophylls ovate-lanceolate, 1.9×0.8 cm, acute, entire, pink, sparsely sericeous, the subtending bracts similar and smaller, the pedicels 2-3 cm long, pink, glabrous; calyx lobes subequal, ovate-lanceolate, ca. 3×1.8 cm, acuminate, weakly serrate, pink, sparsely sericeous; corolla oblique in the calyx, 4-5 cm long, spurred, white, the tube outside sericeous, the lobes subequal, ca. 11×11 mm, entire, with lilac veins, the tube inside with lilac lines in the throat, and with short, capitate, glandular trichomes dorsally; stamens 4, included, the filaments adnate for 7 mm to the base of the corolla tube, ca. 3 cm long, white, glabrous, the anthers coherent into pairs, each anther 2.1×1.2 mm; ovary 4 mm long, sericeous, the style ca. 3 cm long, white, pilose, the stigma stomatomorphic-bilobed; nectary reduced to a double-connate, dorsal gland, 2.4×2 mm, white, glabrous. Fruit a bivalved capsule.

TYPE: PANAMA: BOCAS DEL TORO: Trocha 3 de Noviembre, near Los Guierrez, ca. $8^{\circ} 45' N$, $82^{\circ} 15' W$, 800-900 m alt., 4 April 1978, R. L. Dressler 5803 (HOLOTYPE: SEL). Clonotypes of material in cultivation to be distributed.

DISTRIBUTION: Known only from the type collection.

This fairly compact, showy, and floriferous species appears to have horticultural potential.

35. *Nautilocalyx urticifolius* (Lwbg.) Wiehler, comb. nov.
Episcia urticifolia Lwbg., Acta Bot. Neerl. 7:314. 1958.

TYPE: Archer 1698 (HOLOTYPE: US).

DISTRIBUTION: Colombia: Chocó; Antioquia.

36. *Nautilocalyx villosus* (Kunth & Bouché) Sprague, (Figure 33)
Kew Bull. 1912: 88.
Drymonia villosa Kunth & Bouché, Ind. Sem. Hort. Berol. 1847:12;
Bot. Mag. 81:t. 4866, 1855.
Episcia villosa (Kunth & Bouché) Hanst., Linnaea 34: 348. 1865.

TYPE: Gollmer s.n. (HOLOTYPE: B - destroyed in 1943, I did not find any material there in 1975). NEOTYPE: Cult. in Hort. Vindob. in 1855 (fl. in June), "ex Hort. Berol." (W). This is probably a clone of the type material from Berlin; it agrees completely with my recent field collection from Miranda, Parque Nacional Guatopo, now in cultivation in the United States (Wiehler & Steyermark 72405, SEL).

DISTRIBUTION: Venezuela: Miranda, D.F.; Surinam?: fide Hooker in Bot. Mag. cited above.

37. *Nautilocalyx vinosus* Wiehler, sp. nov. (Plate 11:D)

Inter species generis characterum combinatione differt: foliis bullatis atrovenetis, calyce vinoso corollae limbo purpureo-maculato, antheris in quadrum cohaerentibus, et thecis dehiscentibus poris basalibus.

Terrestrial, perennial, succulent herb; stems branching only at the base, erect, ca. 20-40 cm tall, green, villous, the internodes 3-4 cm long; leaf pairs equal to subequal, the petioles 5-10 mm long, green, sericeous, the lamina ovate, $7-9 \times 4-5$ cm, acuminate, undulate-crenate, the base acute, prominent-

ly bullate, blue-green, and scabrous above, bluish-purple and sericeous below, the lateral pairs of veins 10-12. Inflorescences axillary cymes of 4-6 flowers, the peduncle very short or absent, the prophylls lanceolate, ca. 16×6 mm, light yellow green, with central wine-red blotches, sericeous, the subtending bracts similar, smaller, the pedicels 8-11 mm long, light green, wooly-sericeous; calyx lobes subequal, ovate, ca. 2.4×1.5 cm, acuminate, crenate-serate, the margins ciliate with long capitate-glandular trichomes, wine-red with yellow-green borders, sericeous; corolla oblique in the calyx, ca. 4.2 cm long, spurred, the tube outside cream-white, sericeous, the lobes subequal, ca. 6×6 mm, purple (R.H.S. Colour Chart: Red-Purple Group 61), with cream-white and fimbriate-erose borders, the inside of the tube cream-white and covered with short capitate-glandular trichomes, ventrally furnished with a ridged groove and a yellow nectar-guide; stamens 4, included, the filaments adnate for 5 mm to the base of the corolla tube, ca. 2.5 cm long, white, glabrous, the anthers coherent into a square, each anther 3×2.5 mm, the thecae dehiscing by basal, wine-red stained pores; ovary 4 mm long, wine-red, densely sericeous, the style ca. 2 cm long, wine-red, glabrous, the stigma stomatomorphic-bilobed; nectary reduced to a double-connate, dorsal gland, 2×2 mm, wine-red, glabrous. Fruit a bivalved capsule.

TYPE: *ECUADOR*: PASTAZA: Puyo, open woods near Río Pindo Grande, plants in filtered sunlight, sympatric with *N. ecuadoranus*, 30 July 1971, Wiehler 7154 (HOLOTYPE: SEL).

DISTRIBUTION: Apparently endemic to eastern Ecuador, known only from the type area.

ADDITIONAL MATERIAL EXAMINED: *ECUADOR*: PASTAZA: Puyo; cuttings collected by R. L. Dressler, N. H. Williams & F. L. Stevenson s.n. in Dec. 1974, cult. at SEL under acc. no. W-2041, paratypes collected 28 July 1977, Wiehler 77132 (SEL, others to be distributed).

Bullate leaves as in *Nautilocalyx vinosus* occur also in *N. bullatus*, *N. cataractarum*, and *N. picturatus*, but in these species the leaf shape is lanceolate or oblanceolate. Anthers coherent into a square are rare in *Nautilocalyx*; they are usually coherent into pairs, due to differences in the length of the filaments. Squared anthers have been observed in *N. aeneus*, *N. cataractarum*, *N. colombianus*, *N. porphyrotrichus*, and now in *N. vinosus*. The dehiscence of the anther cells by basal pores is so far known only in *N. dressleri* and *N. vinosus*. The significance of this variation in androecial features in the pollination biology of the genus is still obscure, and its taxonomic importance is, therefore, unknown at present.

38. *Nautilocalyx whitei* Rusby, Mem. New York Bot. Gard. 7: 358. 1927.

TYPE: *White 1830* (HOLOTYPE: NY; ISOTYPE: K).

DISTRIBUTION: Bolivia; Brazil: Acre; Peru: Cuzco; Loreto; Colombia: Vaupes(?).

Nautilocalyx whitei belongs to a species complex difficult to differentiate from herbarium material alone, unless one has previous acquaintance with live material of these similar species. Critical characters, such as leaf texture, glossiness of the adaxial lamina, the absence or presence and location of longitudinal grooves on the tube of the ephemeral corolla, the configuration of the corolla throat, and the color pattern in the inside of the corolla tube are irretrievably lost in pressed and dried herbarium material, and such vital

information is usually not recorded on the collection sheet labels. This group of species includes *N. bullatus*, *N. decumbens*, *N. ecuadoranus*, *N. forgetii*, *N. hirsutus*, *N. hirtiflorus*, *N. leticianus*, *N. lynchii*, *N. mimuloides*, *N. pallidus*, *N. peruvianus*, *N. pictus*, *N. punctatus*, *N. whitei*, and a large number of undescribed species in herbarium collections which will have to be compared with live field collections.

SPECIES EXCLUDED FROM *NAUTILICALYX*

An examination of the holotype (at US) and of an isotype (at WAG) of *Nautilocalyx minutiflorus* shows that this species has non-succulent, almost woody stems, and the habit and ebracteate inflorescence typical for the genus *Cremosperma* Benth. in the tribe Beslerieae Bartling & Wendland. The inflorescence in *Nautilocalyx* is bracteate, characteristic for all taxa in the tribe Episcieae. Long peduncles, present in *N. minutiflorus*, are unknown in *Nautilocalyx*, but occur frequently in *Cremosperma*. The small flowers of *N. minutiflorus* are atypical for *Nautilocalyx* but the norm for *Cremosperma*. The short length of adnation of the stamen filaments to the tube of the corolla in this species is, however, unusual for *Cremosperma* in which these structures are usually fused for about half of the length of the minute corolla. The globose and almost confluent anther locules of *N. minutiflorus* are unknown in *Nautilocalyx*, but typical for *Cremosperma*. The nectary in several flowers examined is ring-shaped and dorsally thickened, typical for *Cremosperma*, but found neither in *Nautilocalyx* nor in other taxa of the tribe Episcieae. The fruit, devoid of sutures or valves, is not the typical bivalved "capsule" of many gesneriads. The irregular dehiscence of some of the fruit of the herbarium material of *N. minutiflorus* may be an artifact, since other fruits on the same sheets are apparently subglobose berries with membranaceous, transparent, unsutured, and unbroken carpel walls. Such fruit is unknown in *Nautilocalyx* but occurs in *Cremosperma* which has also species with regular capsular fruit.

Nautilocalyx minutiflorus represents a foreign element in *Nautilocalyx* and in the tribe Episcieae. It belongs in the ebracteate tribe Beslerieae and fits well into the genus *Cremosperma*.

Cremosperma minutiflorum (L. Skog) Wiehler, comb. nov.

Nautilocalyx minutiflorus L. Skog, Phytologia 28(3): 238. 1974.

TYPE: Wurdack 2072 (HOLOTYPE: US; ISOTYPES: BH, WAG).

DISTRIBUTION: Peru: Amazonas, Loreto.

PARADRYMONIA

Paradrymonia Hanst., emend. Wiehler

Plantae epiphyticae vel terrestres habitu vulgo rosuliformibus, folia caulibus longiora, vel plantae vitiformes caulibus suffrutescentibus.

Paradrymonia Hanst., Linnaea 26:180, 207. 1854.

Episcia Mart. sect. *Paradrymonia* (Hanst.) Leeuwenb., Acta Bot. Neerl. 7:311. 1958.

Centrosolenia Benth., London J. Bot. 5:362. 1846, sensu Morton, exclusive of type species.

Trichodrymonia Oersted, Centralamer. Gesneraceae 38. 1858.

TYPE SPECIES: *T. congesta* Oersted, ibidem.

Episcia sect. *Pagathyra* Leeuwenb., Acta Bot. Neerl. 7:312. 1958.

Episcia sect. *Salpinganthus* Leeuwenb., ibidem, p. 313.

TYPE SPECIES: *Paradrymonia glabra* (Benth.) Hanst., Linnaea 26:207. 1854
[= *P. ciliosa* (Mart.) Wiehler].

ETYMOLOGY: From the Greek *para-* = beside, alongside, close by, and the generic name *Drymonia* Mart., in reference to an assumed close relationship to that genus.

There are over 40 species in the genus, many of them undescribed. All species presently recognized are listed below. Several species published in the last century have not been transferred to *Paradrymonia* in this account, because the original descriptions are insufficient and the types have not yet been located.

1. *Paradrymonia alba* Wiehler, sp. nov.

(Plate 12:A)

Inter species generis characterum combinatione dignoscenda: foliorum laminis ovatis, petiolis fere glabris, corollis albis glabris.

Epiphytic and terrestrial, perennial herb with a loose rosulate habit; stems rarely branching, erect, ca. 20-30 cm tall, up to 3 cm in diam., wine-red, glabrous, the internodes 0.5-1.5 cm long; leaf pairs unequal, the petioles 8-10 cm long, wine-red, sericeous on young leaves, almost glabrous on mature leaves, the lamina ovate, 18-24 × 9-12 cm (large leaf), acute, double-seriate, obtuse, dark green and sparsely sericeous above, lighter green and glabrous below, but sericeous along all veins, the lateral pairs of veins 7-10. Inflorescences axillary cymes of 4-8 flowers, the peduncle 2-6 mm long, wine-red, the prophylls and subtending bracts narrowly lanceolate, 9-13 × 1.5 mm, green, sparsely sericeous, the pedicels ca. 1.2 cm long, wine-red, sparsely sericeous; calyx lobes subequal, lanceolate, ca. 2 × 0.5 cm, acuminate, seriate, green, sericeous; corolla oblique in the calyx, spurred, ca. 5 cm long, white, glabrous, the lobes subequal, ca. 7 × 10 mm, entire, the dorsal part of the tube inside covered with short capitate-glandular trichomes, longitudinal grooves absent; stamens 4, included, the filaments adnate for 5 mm to the base of the corolla tube, ca. 2.9 cm long, white, glabrous, the anthers coherent into a square, each anther 2 × 2 mm, the thecae dehiscent by longitudinal slits; ovary 4 mm long, wine-red, sericeous, the style ca. 2.8 cm long, white, glandular-pilose, the stigma stomatomorphic; nectary reduced to a double-connate, dorsal gland, 2 × 1.2 mm, white, glabrous. Fruit a bivalved capsule.

TYPE: PANAMA: BOCAS DEL TORO: Filo de Almirante, valley beyond ridge when approaching from Almirante, 22 May 1972, Wiehler & Dressler 72303 (HOLOTYPE: SEL).

DISTRIBUTION: Known only from the type locality.

2. *Paradrymonia aurea* Wiehler, sp. nov.

(Plate 12:B)

Ex affinitate *P. lineata* (Morton) Wiehler a quo differt foliis majoribus, calycibus non subulatis filiformi-attenuatisque, corollis luteis sericeis, et corollarum lobis non lineatis.

Epiphytic, perennial, rosulate herb; stems suckering from the base, erect or decumbent, to 10 cm tall, congested with leaves, adventitious roots,

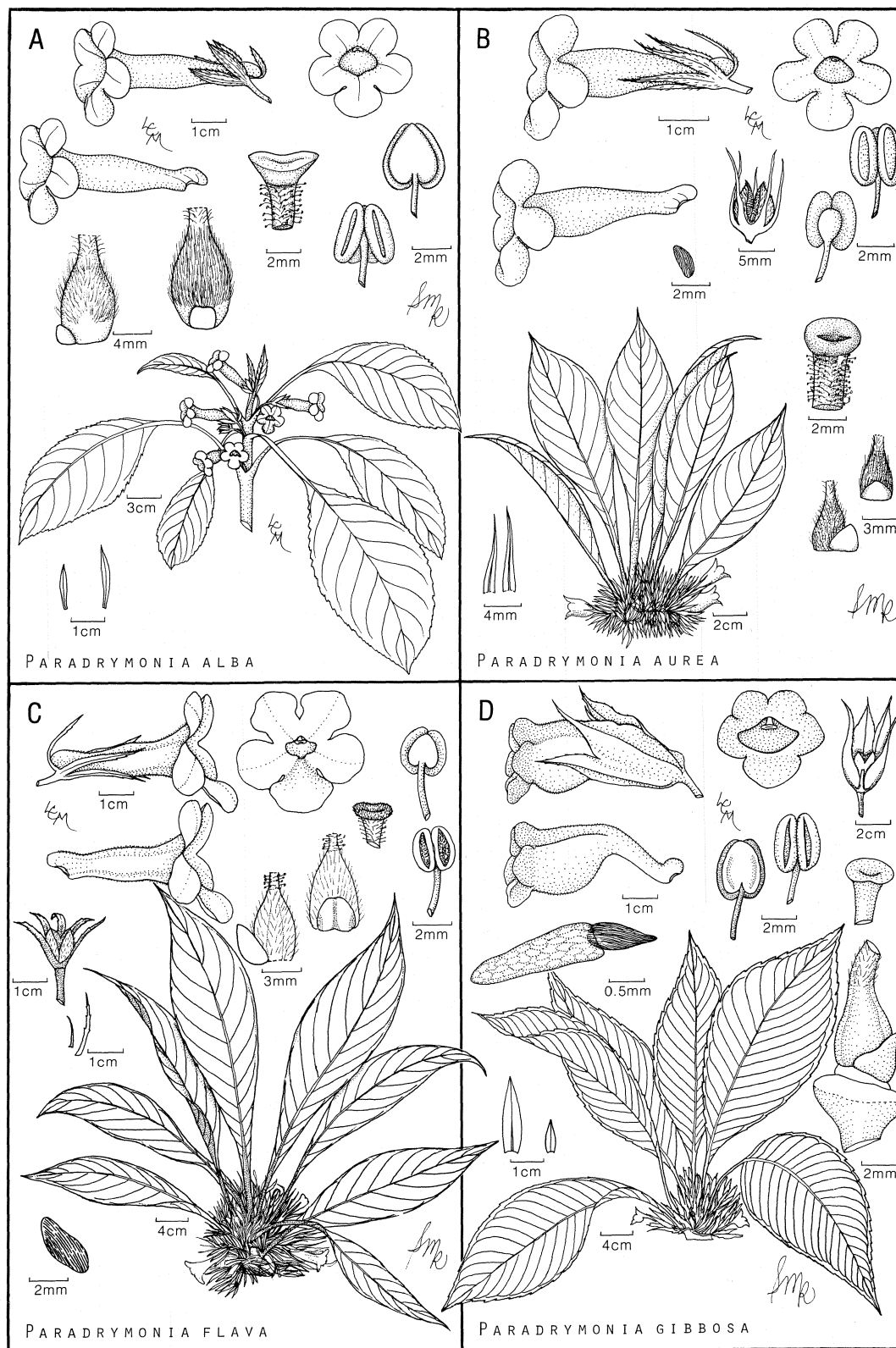


PLATE 12

and inflorescences, the internodes very short, hidden from view; leaf pairs equal to extremely unequal, the petioles 1.5-2.5 cm long, flushed with rose or wine-red, glabrous, but ciliate along the 2 dorsal ridges, the lamina of the larger leaf of a pair oblanceolate or elliptic, 30-50 × 6-10 cm, acuminate, subentire, decurrent, leathery, medium green or bluish green and glabrous above, pale green or flushed with rose-purple and glabrous below, the lateral pairs of veins 15-18, the other leaf of a pair either equal, often smaller, sometimes less than 1 cm long, subulate, often withered, persistent or caducous, the size depending on the position of the leaf and shoot on the congested plant body. Inflorescences axillary cymes of 8-12 or more flowers, the peduncle 1-2 mm long or absent, the prophylls and subtending bracts subulate, 6-10 × 1.2 mm, wine-red, glabrous, the pedicels 0.8-1.7 cm long, wine-red, glabrous; calyx lobes subequal, 1.3-2.9 × 0.2-0.4 cm, narrowly lanceolate, long acuminate, serrate, wine-red to dark maroon, sparsely sericeous; corolla oblique in the calyx, ca. 3.5-4.2 cm long, cream-white from the spur to the mid-point, golden yellow from the mid-point to and including the limb, the tube and lobes outside sericeous, the face of the limb glabrous, with the lobes subequal, each ca. 9 × 10 mm, entire, golden yellow, speckled with wine-red or maroon, the tube inside yellow, the dorsal part covered with short, capitate-glandular trichomes (in the Cutucú population this area is, in addition, colored wine-red, with two cream-white longitudinal stripes), longitudinal grooves absent; stamens 4, included, the filaments adnate for 6-8 mm to the base of the corolla tube, ca. 2.5-2.8 cm long, white, glabrous, the anthers coherent into a square, each anther 2 × 2 mm, the thecae dehiscent by longitudinal slits; ovary 3-4 mm long, wine-red, sericeous, the style ca. 2.5 cm long, white or flushed with rose, glandular-pilose, the stigma capitate-stomatomorphic; nectary reduced to a prominent double-connate, dorsal gland, 2-2.8 × 2.5 mm, white, glabrous. Fruit a bivalved capsule.

TYPE: *ECUADOR*: NAPO: epiphyte in woods ca. 3 km south of Tena, 3 Aug. 1971, *Wiehler 7199* (SEL, sterile); flowered in cultivation at SEL under acc. no. W-1747, herbarium material prepared 13 May 1975, *Wiehler 75269* (HOLOTYPE: SEL: ISOTYPES: AAU, K, NY, QCA, S, US).

DISTRIBUTION: Eastern slopes of the Ecuadorian Andes.

ADDITIONAL MATERIAL EXAMINED: *ECUADOR*: MORONA-SANTIAGO: Cordillera de Cutucú, 25 km SE of Logroño, 900 m alt., common epiphyte in montane forest, 17 Jan. 1976, *M. T. Madison & F. R. Coleman 2608* (SEL); same material cult. at SEL under acc. no. W-2271, herbarium specimens prepared 18 Aug. 1978, *Wiehler 78131* (BH, S, SEL, US, others to be distributed). PASTAZA: Puyo, cultivated in the garden of Joe Brenner, Hotel Turingia, originally collected in the area of Tena, 31 July 1971, *Wiehler s.n.* (SEL); same place, 12 Aug. 1978, *Dodson s.n.* (SEL).

The growth pattern of this species, typical of many species of *Paradrymonia* (also observed in live plants of *P. ciliosa*, *P. decurrens*, *P. flava*, *P. gibbosa*, *P. gigantea*, *P. hypocyrta*, *P. lineata*, *P. lurida*, and *P. macrophylla*) illustrates a facet of the morphological flexibility of the Gesneriaceae. Isophylly and anisophylly are usually fixed traits within a gesneriad species at maturity. In *Paradrymonia aurea* and in the species cited above, the opposite-decussate leaf pairs on the same mature plant, or even on the same shoot, may show the following conditions: 1), the two leaves may be completely equal in size, over 50 cm long and 20 cm wide in some species, 2), the leaf pairs may be subequal or moderately anisophyllous, and 3), they may be extreme-

ly anisophyllous, with the smaller leaf of a pair less than 1 cm long, subulate, and often early caducous, so that the remaining large leaves appear to be in an alternate phyllotaxy (Figure 125).

This expression of anisophylly seems to be triggered by the crowding of the leaves and rosettes of the adventitious shoots surrounding the main shoot. In contrast to other anisophyllous gesneriad taxa in which the onset of anisophylly is irreversible after the seedling stage, in a large number of species of *Paradrymonia* the expression of anisophylly is facultative depending on the availability of growing space.

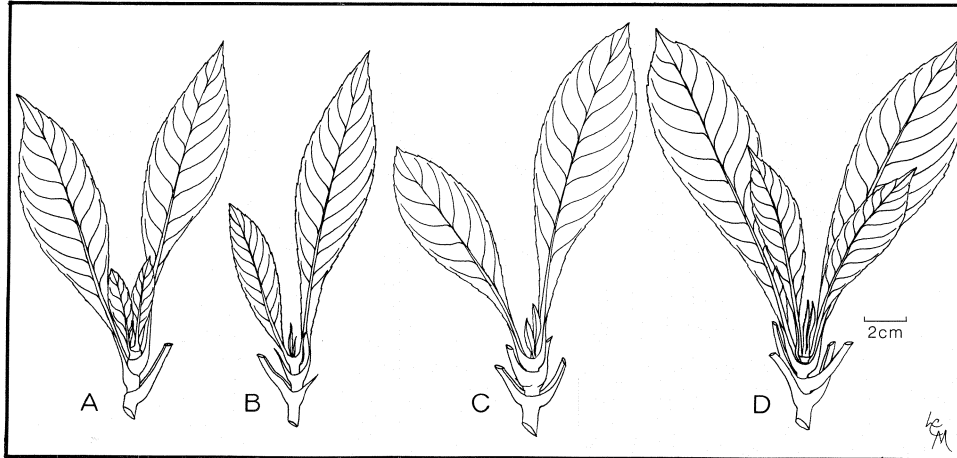


Figure 125: Vegetative shoots with facultative anisophylly from a single, mature plant of *Paradrymonia aurea*. A, leaf pairs extremely anisophyllous, the smaller leaf of a pair withered and fallen off, the phyllotaxy seemingly alternate; B, leaf pairs extremely anisophyllous, the smaller leaf of a pair subulate, persistent; C, leaf pairs subequal; D, leaf pairs isophyllous.

3. *Paradrymonia buchtienii* (Mansf.) Wiehler, comb. nov.

Episcia buchtienii Mansf., in Fedde, Repert. 38:25. 1935.

TYPE: *Buchtien 1344* (HOLOTYPE: lost at B in 1943; LECTOTYPE: NY).

DISTRIBUTION: Bolivia.

4. *Paradrymonia campostyla* (Leeuwenb.) Wiehler, comb. nov.

Drymonia campostyla Leeuwenb., Acta Bot. Neerl. 7:305. 1958.

TYPE: *Jonker 625* (HOLOTYPE: U).

DISTRIBUTION: Guianas; Brazil: Amapá.

This vining epiphytic or terrestrial species is misplaced in *Drymonia* by the absence of the critical anther characters essential to the concept of *Drymonia*. The anthers, with each cell dehiscing by a central pore, are typical for *Paradrymonia* into which this species fits in all other characteristics.

5. *Paradrymonia ciliosa* (Mart.) Wiehler, Phytologia

(Figure 34)

27(5):308. 1973.

Hypocyrtia ciliosa Mart., Nov. Gen. & Sp. Pl. 3:53. 1829.

TYPE: *Martius 3117* (HOLOTYPE: M).

Episcia ciliosa (Mart.) Hanst., in Martius, Fl. Bras. 8(1):403. 1864.

Columnnea ciliosa (Mart.) Kuntze, Rev. Gen. Pl. 2:472. 1891.

Centrosolenia glabra Benth., Bot. Mag. 76:t. 4552. 1850.

TYPE: *Cult. Hort. Kew.*, from material sent by Wagener to Kew from Venezuela: D. F.: La Guaira ("Guayra").

Paradrymonia glabra (Benth.) Hanst., Linnaea 26:207. 1854.

Episcia glabra (Benth.) Hanst., Linnaea 34:349. 1865.

DISTRIBUTION: Brazil: Amazonas; Venezuela: Amazonas, Miranda, D.F., Carabobo; Guianas; Peru: Huanuco, Puno.

Next to *P. metamorphophylla*, *P. ciliosa* is the most widely distributed species of the genus.

6. *Paradrymonia conferta* (Morton) Wiehler, comb. nov.

Centrosolenia conferta Morton, J. Washington Acad. Sci. 35:(4): 126. 1945.

Episcia conferta (Morton) Leeuwenb., Acta Bot. Neerl. 8:52. 1959.

TYPE: *Metcalf & Cuatrecasas 30200* (HOLOTYPE: US, not UC, as stated by Leeuwenberg, 1959, p. 52; ISOTYPE: UC).

DISTRIBUTION: Colombia: Antioquia. Known only from type collection.

7. *Paradrymonia congesta* (Oersted) Wiehler, comb. nov.

Trichodrymonia congesta Oersted, Centralamer. Gesneraceer 38. 1858.

Episcia congesta (Oersted) Hanst., Linnaea 34:347. 1865.

TYPE: *Liebmann s.n.*, Oct. 1842 (HOLOTYPE: C; ISOTYPES: K, US).

DISTRIBUTION: Mexico: Oaxaca.

8. *Paradrymonia dariensis* (Seem.) Wiehler, comb. nov.

Alloplectus dariensis Seem., Bot. Voy. Herald 187. 1854.

Episcia dariensis (Seem.) Leeuwenb., Acta Bot. Neerl. 8:52. 1959.

TYPE: *Seemann 1058* (HOLOTYPE: K; ISOTYPE: BM).

DISTRIBUTION: Colombia: Chocó; possibly also in Panama: Darien.

9. *Paradrymonia decurrens* (Morton) Wiehler, Phytologia (Figure 35)
27(5):308. 1973.

Centrosolenia decurrens Morton, Fieldiana, Bot. 18(3-4):1156. 1938.

Episcia decurrens (Morton) Leeuwenb., Acta Bot. Neerl. 8:53. 1959.

TYPE: *Standley & Valerio 48589* (HOLOTYPE: US).

DISTRIBUTION: Panama, Costa Rica, Nicaragua.

10. *Paradrymonia densa* (C. H. Wright) Wiehler, comb. nov.

Episcia densa C. H. Wright, Kew Bull. 1895: 17; Bot. Mag. 122:t. 7481. 1896.

Centrosolenia densa (C. H. Wright) Sprague, Kew Bull. 1912:87.

TYPE: *Jenman 2414* (HOLOTYPE: K).

DISTRIBUTION: Guianas.

11. *Paradrymonia erythropus* (Hook. f.) Wiehler, comb. nov.

Episcia erythropus Hook. f., Bot. Mag. 102:t. 6219. 1876.

TYPE: *Hort. Kew.*, from material introduced by Veitch Nursery from Colombia (HOLOTYPE: K). The only other collection of this species comes

from Río Nare, Antioquia, in 1937: *O. Haught* 2172 (US, NY, UC).

DISTRIBUTION: Colombia.

12. *Paradrymonia flava* Wiehler, sp. nov.

(Plate 12:C)

P. dariensi (Seem.) Wiehler affinis, sed foliis latioribus, calycum lobis brevioribus, lanceolatis neque laciniatis neque fimbriatis, corollis majoribus externe eburneis, et ovarii capsulisque sericeis notabilis.

Epiphytic or facultative terrestrial, perennial, rosulate herb; stems suckering from the base, erect, very short (to 10 cm tall), 3.5 cm in diam., congested with leaves, adventitious roots, and inflorescences, the internodes very short, hidden from view; leaf pairs equal to extremely unequal, the petioles 3-6 cm long, green, flushed with rose, almost glabrous, but ciliate along the 2 dorsal ridges, the lamina of the larger leaf of a pair lanceolate, oblanceolate, or elliptic, 30-55 × 6-12 cm, acuminate, denticulate, decurrent, leathery, medium green above, pale green below, the abaxial veins flushed with rose, glabrous on both sides, the lateral pairs of veins 10-16, the opposing leaf either of equal size, or smaller, often less than 1 cm long, withered, persistent, or caducous. Inflorescences axillary cymes of 4-8 flowers, the peduncle absent, the prophylls and subtending bracts subulate, 1-2 cm long, sparsely dentate, wine-red, the pedicels ca. 2 cm long, yellow-green, suffused with pink, glabrous; calyx lobes of the same color, subequal, narrowly lanceolate, ca. 2.8 cm long, serrate, sparsely sericeous; corolla oblique in the calyx, infundibular, 4.5-6 cm long, cream-white and sericeous outside, the lobes subequal, ca. 11 × 11 mm, entire, the face of the limb and the tube inside lemon yellow, the inside of the lobes and the dorsal part of the tube within covered with short, capitate-glandular trichomes; stamens 4, included, the filaments adnate for 5 mm to the base of the corolla tube, ca. 2.8 cm long, white, glabrous, the anthers coherent into a rectangle, each anther 2 × 2 mm, the thecae dehiscing by longitudinal slits; ovary 3 mm long, wine-red, sericeous, the style ca. 2.5 cm long, rose, densely glandular-pilose, the stigma stomatomorphic; nectary reduced to a double-connate, dorsal gland, 2 × 2 mm, white, glabrous. Fruit a bivalved, fleshy, sericeous capsule, the seeds oblong, 1 × 0.3 mm, dark brown, striate, with fleshy funicles 2.5 mm long.

TYPE: PANAMA: COLÓN: Río Guanche, near Portobelo. Epiphyte 2½ m up on tree in the middle of a small, rocky tributary, 10 Aug. 1971, *Wiehler & Dressler* 71158 (HOLOTYPE: SEL; ISOTYPES: BH, F, GH, K, MO, NY, PMA, US).

DISTRIBUTION: Eastern Panama, in the Provinces of Darien, Panamá, Colón, and Veraguas.

ADDITIONAL MATERIAL EXAMINED: PANAMA: DARIEN: Primary forest along headwater of Río Tuquesa, ca. 2 km air distance from Continental Divide, in vicinity of upper gold mining camp of Tyler Kittredge (ca. 77° 30' W, 8° 30' N), epiphytic, petioles and leaves purplish, flower yellow, 25 Aug. 1974, *Croat* 27164 (MO); PANAMA: about 19 km N of El Llano, on El Llano - Cartí highway, on log, flowers yellow, buds speckled dull red without, 27 Feb. 1973, *Dressler* 4278 (SEL); VERAGUAS: NW of Santa Fé, 11 km from Escuela Agrícola Alto de Piedra, in valley of Río Dos Bocas, Atlantic slope, 450-550 m alt., terrestrial, stemless, corolla light yellow, 20 Dec. 1974, *Mori & Kallunki et al.* 3838 (MO).

This species with its showy yellow corolla lobes is rather floriferous in cultivation.

13. *Paradrymonia gibbosa* Wiehler, sp. nov.

(Plate 12:D)

Haec species insignis calycibus foliosis partim connatis marroninis, et corollis ventraliter gibbosis marroninis recognita.

Epiphytic or facultatively terrestrial, perennial, rosulate herb; stems suckering from the base, erect or ascending, to 40 cm tall (in very old plants), ca. 3 cm in diam., congested with leaves, adventitious roots, and inflorescences, the internodes very short, hidden from view; leaf pairs equal to extremely unequal, the petioles 6-20 cm long, yellow-green, glabrous, the lamina of the larger leaf of a pair elliptic, 25-55 × 12-20 cm, acuminate, denticulate-undulate, decurrent, leathery, medium green above, pale green below, glabrous on both sides, the lateral pairs of veins 17-21, the opposing leaf similar, either of equal size, or smaller, often less than 1 cm long, subulate, withered, persistent or caducous. Inflorescences axillary cymes of 4-8 flowers, the peduncle absent, the prophylls lanceolate, ca. 2.3 × 0.6 cm, maroon, puberulous, the subtending bracts similar, ca. 1 × 0.3 cm, the pedicels 1-2 cm long, green flushed with rose, puberulous; calyx lobes unequal, lanceolate to oblanceolate, the 2 lateral and 2 lower lobes ca. 4-5 × 1.2-1.4 cm, connate for ca. 2 cm, acuminate, serrate, light green at the base, then changing to deep maroon, puberulous, the dorsal lobe smaller and similar, hidden by the 2 laterals, free, narrowly lanceolate, ca. 3.5-4.1 × 0.6-0.8 cm; corolla oblique in the calyx and for $\frac{3}{4}$ of its length (in the type) or almost completely (in *Wiehler* 7278) hidden by it, tubular-infundibular, ca. 5 cm long, spurred, constricted proximally to a narrow, cream-white and glabrous tube, then abruptly expanding and ventrally gibbous near the limb, deep maroon, puberulous, the lobes subequal, ca. 13 × 13 mm, entire, deep maroon, glabrous within, the tube inside maroon, covered with short capitate-glandular trichomes; stamens 4, included, the filaments adnate for ca. 1 cm to the base of the corolla tube, ca. 3.2 cm long, white, glabrous, the anthers coherent into a square, each anther 3 × 2 mm, the thecae dehiscent by longitudinal slits; ovary 4 mm long, maroon, glabrous, the style ca. 2.9 cm long, white, pilose, the stigma capitate-stomatomorphic; nectary reduced to a double-connate, dorsal gland, 2 × 2 mm, white, glabrous. Fruit a bivalved, fleshy, maroon, glabrous capsule; seeds oblong, 1 × 0.5 mm, dark brown, striate, with a fleshy funicle 3 mm long.

TYPE: COLOMBIA: VALLE: old road from Cali to Buenaventura, ca. 10 km below Queremal, plants on trees, forest floor and roadside cuts, sympatric with *P. gigantea*, 1 May 1972, *Wiehler, Dressler, N. H. & N. F. Williams* 72120 (SEL, sterile); cult. at SEL, acc. no. W-1663, herb. specimens prepared 3 Nov. 1976, *Wiehler* 76246 (HOLOTYPE: SEL; ISOTYPES: COL, NY, US, VALLE).

DISTRIBUTION: Colombia, known only from the State of Valle del Cauca.

ADDITIONAL MATERIAL EXAMINED: COLOMBIA: VALLE: old road from Cali to Buenaventura, near La Elsa, epiphytic and terrestrial, 30 April 1972, *Wiehler, Dressler, N. H. & N. F. Williams* 7278 (SEL).

Paradrymonia gibbosa was found to grow sympatrically in both collection localities with *P. gigantea*. Both species have the same habit, similar leaves, the same deep maroon color of the flower, and both bloom at the same time.

14. *Paradrymonia gigantea* Wiehler, sp. nov.

(Plate 13:A)

P. gibbosae Wiehler (vide supra) habitu, foliis, et floribus marroninis accessit, sed foliorum laminis majoribus (ad 70×35 cm), plus venis lateralibus (28-33), corollis non gibbosis, et ovariis sericeis distinguitur.

Epiphytic or terrestrial, perennial, rosulate herb; stems suckering from the base, erect to ascending, to 15 cm tall, ca. 3 cm in diam., congested with leaves, adventitious roots, and inflorescences, the internodes very short, hidden from view; leaf pairs equal to extremely unequal, the petioles 8-25 cm long, fleshy, light green flushed with rose, puberulous-hirsute on young shoots, glabrous on mature leaves, the lamina of the larger leaf of a pair elliptic, $30-70 \times 12-35$ cm, acute or acuminate, denticulate, decurrent, leathery, corrugated parallel to the lateral veins, medium green above, pale green below, puberulous-hirsute on both sides on young laminas, glabrescent on mature leaves, the lateral pairs of veins 28-33, the opposing leaf similar, either equal in size or smaller, often less than 1.5 cm long, subulate, withered, persistent or caducous. Inflorescences axillary cymes of 4-8 flowers, the peduncle 1-2 mm long or absent, the prophylls and subtending bracts linear, $1-1.8 \times 0.1-0.2$ cm, light green flushed with rose, puberulous, the pedicels 1-2 cm long, light green or flushed with rose, puberulous; calyx lobes unequal, lanceolate, the 2 lateral and 2 lower lobes ca. 4.5×1.5 cm, connate for ca. 2 cm, acuminate, serrate, light green or rose at the base, rose (in cult.) or deep maroon (in field) above, puberulous, the dorsal lobe similar, much smaller, ca. 2.5×0.3 cm, free, arching over the visible spur, the upper half concealed by the 2 laterals; corolla oblique in the calyx, infundibular, ca. 5.5 cm long, spurred, the proximal $2/3$ a narrow tube, cream-white, sericeous, the distal $1/3$ abruptly widened, funnel-shaped, deep maroon, sericeous, the lobes subequal, ca. 1.3×1.5 cm, entire, the face of the limb and the tube inside maroon covered with short, capitate-glandular trichomes; stamens 4, included, the filaments adnate to the narrow corolla tube for almost its entire length (ca. 2 cm), connate for the same length, altogether ca. 4 cm long, white, with maroon blotches, glabrous, the anthers coherent into a square, each anther 2.5×2 mm, the thecae dehiscent by longitudinal slits; ovary 4 mm long, white, sericeous, the style ca. 3.4 cm long, white, pilose, with scattered glandular hairs, the stigma stomatomorphic; nectary reduced to a large, double-connate, dorsal gland, 3×4.5 mm, white, glabrous. Fruit a bivalved, fleshy capsule, light green, sericeous; seeds oblong, 1×0.3 mm, dark brown, striate, with a fleshy funicle ca. 2.3 mm long.

TYPE: *COLOMBIA*: VALLE: old road from Cali to Buenaventura, near La Elsa, epiphytic and terrestrial, sympatric with *P. gibbosa*, 30 April 1972, Wiehler, Dressler, N. H. & N. F. Williams 7236 (SEL); cult. at SEL, acc. no. W-1687, herb. specimens prepared 3 Nov. 1976, Wiehler 76247 (HOLOTYPE: SEL; ISOTYPES: BH, COL, F, GH, K, MO, NY, U, US, VALLE).

DISTRIBUTION: *COLOMBIA*: Known only from the State of Valle de Cauca.

ADDITIONAL MATERIAL EXAMINED: *COLOMBIA*: VALLE: old road from Cali to Buenaventura, ca. 10 km W of type locality, low-growing epiphyte, 30 April 1972, Wiehler, Dressler, N. H. & N. F. Williams 7277 (SEL, pickled material only).

This species has probably the largest leaves among the New World Gesneriaceae, resembling in habit and foliage some of the large-leaved, rosette-

forming members of the aroid genus *Anthurium*. *Paradrymonia gigantea* and *P. gibbosa* are doubtlessly closely related, sharing also the same kind of partially connate calyx lobes. This feature was found also in a third, still undescribed species along the same road in Colombia [Wiehler *et al.* 72145, 72146 (SEL, without corollas)]. A total of eight species of *Paradrymonia* were found on the old road from Cali to Buenaventura, two of them described below.

15. *Paradrymonia hansteiniana* (Mansf.) Wiehler, comb. nov.

Episcia hansteiniana Mansf., in Fedde, Repert. 38:25. 1935.

TYPE: *Tessmann 5988* (HOLOTYPE: lost at B in 1943; I found no other material in European herbaria).

DISTRIBUTION: Peru: LORETO: Iquitos.

16. *Paradrymonia hypocyrta* Wiehler, Selbyana 2(1):82, (Figure 109)
pl. 25:C. 1977.

TYPE: *Dodson 6092* (HOLOTYPE: SEL; ISOTYPES: K, NY, QCA, S, US).

DISTRIBUTION: Ecuador: Los Ríos: Known only from type locality.

17. *Paradrymonia lineata* (Morton) Wiehler, Phytologia (Figure 36)
27(5):308. 1973.

Centrosolenia lineata Morton, Ann. Missouri Bot. Gard. 29:41. 1942.

Episcia lineata (Morton) Leeuwenb., Acta Bot. Neerl. 8:53. 1959.

TYPE: *Allen 2717* (HOLOTYPE: US; ISOTYPE: MO).

DISTRIBUTION: Panama, Costa Rica.

18. *Paradrymonia longifolia* (Poeppig) Wiehler, comb. nov.

Drymonia longifolia Poeppig, in Poeppig & Endlicher, Nov. Gen. & Sp.
Pl. 3:4. 1840.

Episcia longifolia (Poeppig) Hanst., Linnaea 34:347. 1865.

TYPE: *Poeppig 1671* (HOLOTYPE: W).

DISTRIBUTION: Peru. Known only from holotype, collected at Cuchero, Huanuco, in 1829, and a recent collection without locality, *E. E. Smith* 338, Sept. 1953, "Peru," (Clyde Reed herb., cf. US).

19. *Paradrymonia longipedunculata* (Donn. Smith) Wiehler, comb. nov.

Episcia longipedunculata Donn. Smith, Bot. Gaz. (Crawfordsville) 25:
152. 1898.

Centrosolenia longipedunculata (Donn. Smith) Morton, Fieldiana, Bot.
18.1159. 1938.

TYPE: *Pittier 2593* (HOLOTYPE: US).

DISTRIBUTION: Costa Rica: SAN JOSÉ: Carillo.

20. *Paradrymonia lurida* (Morton & Raymond) Wiehler, (Figure 37)
Phytologia 27(5):308. 1973.

Episcia lurida Morton & Raymond, Baileyana 18(1):9-12, figs 1-2 1971.

TYPE: *Raymond s.n.*, Aug. 1966 (HOLOTYPE: US; ISOTYPE: MTJB). Most of the plants currently in cultivation in North America are clones of the type

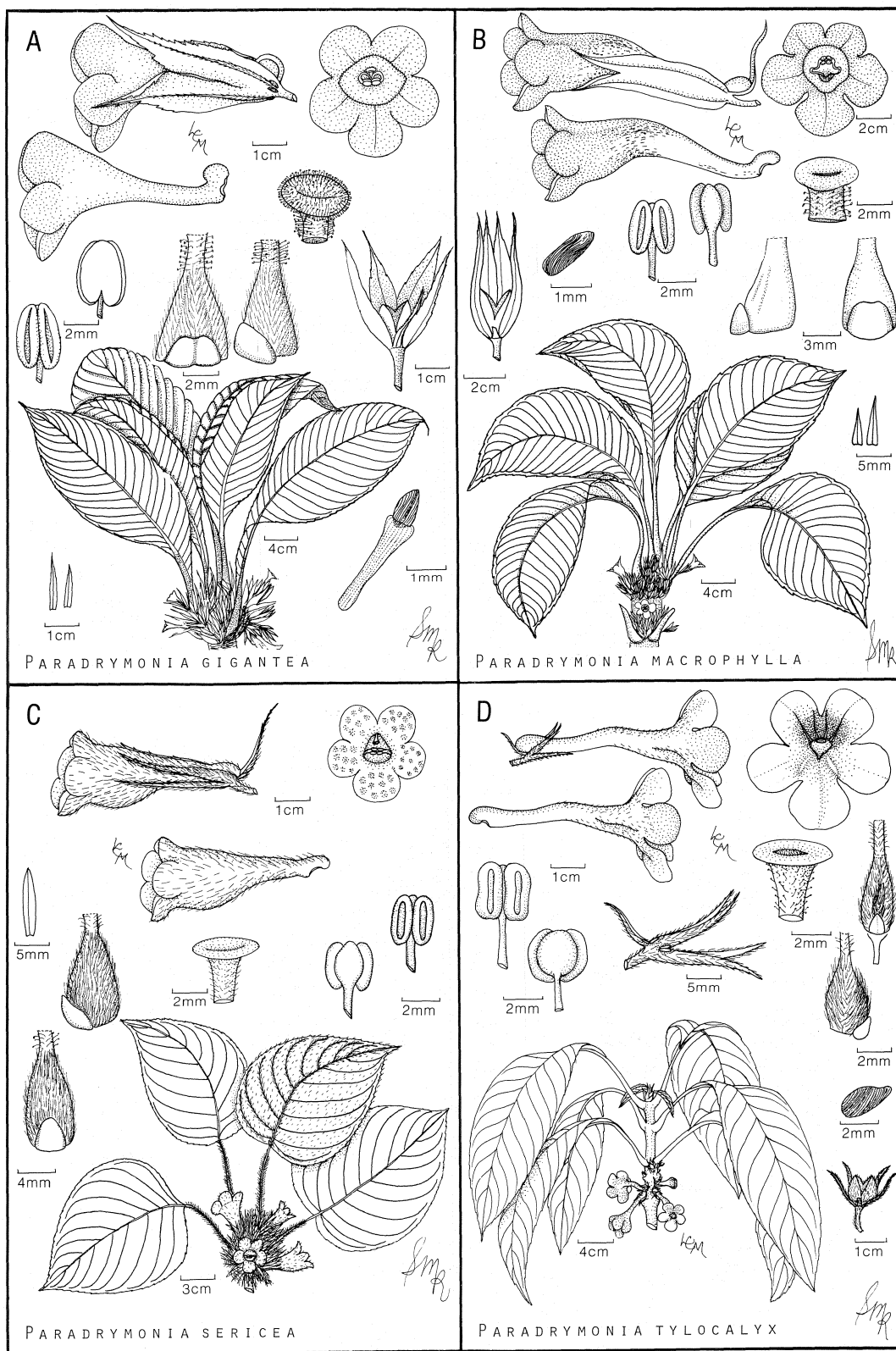


PLATE 13

material sent by C. Horich from Cariblanca, Alajuela, Costa Rica, to Cornell University in 1959.

DISTRIBUTION: Costa Rica: Alajuela.

21. *Paradrymonia macrophylla* Wiehler, sp. nov. (Plate 13:B)

Ex affinitate *P. gibbosa* Wiehler et *P. gigantea* Wiehler (vide supra), sed a prima corollis non gibbosis glabris, a secunda foliis parvioribus, calycum lobis angustioribus, corollis in medio flexis glabris, et ovariis glabris distincta.

Epiphytic or terrestrial, perennial, rosulate herb; stems suckering from the base, sparsely branching above, erect or ascending, to 20 cm tall, ca. 3 cm in diam., congested with leaves, adventitious roots, and inflorescences, the internodes very short, hidden from view; leaf pairs equal to extremely unequal, the petioles 8-28 cm long, fleshy, yellow-green flushed with rose, puberulous in young leaves, glabrous in mature leaves, the lamina of the larger leaf of a pair ovate or elliptic, 20-55 × 9-30 cm, acute to acuminate, denticulate, decurrent, leathery, weakly corrugated parallel to the lateral veins, medium green above, pale green or flushed with rose below, glabrous on both sides, the lateral pairs of veins 18-24, the opposing leaf similar, either equal in size or smaller, often less than 1.5 cm long, subulate, withered, persistent or caducous. Inflorescences axillary cymes of 4-8 flowers, the peduncle absent, the prophylls and subtending bracts lanceolate, minute, 5-9 × 1-2 mm, wine-red, puberulous, pedicels 8-11 mm long, wine-red, puberulous; calyx lobes unequal, lanceolate, the 2 lateral and the 2 lower lobes ca. 3 × 0.4 cm, connate for ca. 1.6 cm, acuminate, serrate, proximally wine-red, distally green flushed with wine-red, puberulous, the dorsal lobe similar, 1.5 × 0.2 cm, free, arching over the visible spur, not hidden by the lateral lobes; corolla oblique in the calyx, infundibular, ca. 5 cm long, spurred, the proximal half a narrow tube, cream-white, spotted with wine-red, glabrous, the distal half gradually expanding, wine-red turning maroon, glabrous, the lobes subequal, ca. 1 × 1 cm, entire, the entrance of the tube inside maroon, dorsally with short glandular hairs, the narrow tube inside cream-white, glabrous; stamens 4, included, the filaments adnate for 6 mm to the base of the corolla tube, ca. 3.5 cm long, white, glabrous, the anthers coherent into a square, each anther 2 × 1.6 mm, the thecae dehiscent by longitudinal slits; ovary 5 mm long, white, glabrous, the style ca. 3.5 cm long, proximally rose, pilose, distally white, glandular pilose, the stigma stomatophytic; nectary a reduced, double-connate, dorsal gland, 2 × 2.5 mm, white, glabrous. Fruit a bivalved, fleshy capsule, yellow-green, glabrous; seeds oblong, 0.8 × 0.3 mm, dark brown, striate, with a fleshy funicle ca. 2.1 mm long.

TYPE: PANAMA: COCLÉ: hills N of El Valle de Anton, cloud forest, large terrestrial rosettes, 15 Aug. 1971, *Wiehler & Dressler 71286* (HOLOTYPE: SEL; ISOTYPES: F, K, MO, NY, PMA, US).

DISTRIBUTION: Panama, known only from the Provinces of Coclé and Veraguas.

ADDITIONAL MATERIAL EXAMINED: PANAMA: COCLÉ: near type locality, vicinity of La Mesa, ca. 1000 m alt., epiphytic, 12 Nov. 1941, *Allen 2794* (MO, US - 2 sheets); same area, epiphyte in cloud forest, 3 Oct. 1967, *Dressler 3047* (SEL); same area, woods adjacent to chicken farm, terrestrial, 3 Jan. 1974, *Dwyer 11889* (MO); Cerro Pajita, hills N of El Valle, 1100 m alt., large terrestrial plants, 27 Oct. 1946, *Allen 3778* (MO);

VERAGUAS: on Caribbean slope above Río Primero Brazo, ca. 8 km NW of Santa Fé, 700-1200 m alt., primary forest, terrestrial, 18-19 March 1973, *Liesner* 998 (MO); 15-20 km NW of Santa Fé, between Escuela Agrícola Alto Piedra and Continental Divide, 650-800 m alt., epiphyte, 8 Sept. 1974, *Dressler* 4741 (SEL).

This species belongs to the same (unnamed) section as *P. gibbosa* and *P. gigantea*. In Panama and Central America, *Paradrymonia macrophylla* has the largest leaves among its congeners. Two other species of the genus are native to the gesneriad-rich region of the El Valle de Anton: *P. decurrens* and *P. lineata*.

22. *Paradrymonia maculata* (Hook. f.) Wiehler, comb. nov.

Episcia maculata Hook. f., Bot. Mag. 116:t 7131. 1890.

TYPE: *Cult. Hort. Kew.*, 2 Sept. 1889 (HOLOTYPE: K).

DISTRIBUTION: Guyana.

This interesting species from Guyana, not yet in cultivation, is a vine with stems to 1 m long, and with adventitious hold-fast roots on nodes and internodes. It is not yet known whether *P. maculata* ever produces the rosettes typical for the genus. Some of its congeners, notably *P. ciliosa*, *P. decurrens*, and several undescribed species, possess the versatility to develop both rosettes and vining stems.

23. *Paradrymonia metamorphophylla* (Donn. Smith) Wiehler, *Phytologia* 27(5):327. 1973.

Alloplectus metamorphophylla Donn. Smith, Bot. Gaz. (Crawfordsville) 52:52. 1911.

TYPE: *Tonduz* 10884 (HOLOTYPE: US).

DISTRIBUTION: Peru, Ecuador, Colombia, Panama, Costa Rica.

Paradrymonia metamorphophylla is the most widely distributed species of the genus.

24. *Paradrymonia sericea* Wiehler, sp. nov.

(Plate 13:C)

Forte *P. metamorphophyllae* (Donn. Smith) Wiehler affinis, sed internodiis brevibus, foliis ovatis, bracteis subulatis, et corollis albis lobis magentio-maculatis recedit.

Epiphytic or terrestrial, perennial, rosulate herb; stems suckering from the base, erect, to 3-6 cm tall, ca. 1 cm in diam., congested with leaves and inflorescences, the internodes very short, sericeous; leaf pairs equal to extremely unequal, the petioles 4-9 cm long, green, densely sericeous, the lamina of the larger leaf of a pair ovate, 11-18 × 7-10 cm, acuminate or acute, serrulate-denticulate, obtuse, leathery, medium green above, lighter green below, sericeous on both sides, but densely sericeous in young leaves, the lateral pairs of veins 7-9, the opposing leaf similar, either equal in size or smaller, often only ca. 1 cm long, subulate, persistent or caducous. Inflorescences axillary cymes of 4-8 flowers, the peduncle absent, the prophylls and subtending bracts subulate and minute, ca. 1 × 0.2 cm, rose, sericeous, the pedicels 4-7 mm long, rose, sericeous; calyx lobes unequal, linear-lanceolate, the 2 lateral and 2 lower lobes ca. 4.5 × 0.2-0.3 cm, with 2-3 subulate teeth on each margin, rose, sericeous, the dorsal lobe similar, ca. 3 × 0.2 cm; corolla

oblique in the calyx, tubular-infundibular, ca. 5.5 cm long, spurred, cream-white, sericeous, the lobes subequal, ca., 1×1 cm, entire, the face of the limb spotted with magenta and glabrous, the tube inside glabrous, but dorsally furnished with short glandular trichomes; stamens 4, included, the filaments adnate for 4 mm to the base of the corolla tube, ca. 3.2 cm long, white, glabrous, the anthers coherent into a square, each anther 2×2 mm, the thecae dehiscing by longitudinal slits; ovary 4 mm long, rose, densely sericeous, the style ca. 3.4 cm long, white, sericeous, the stigma stomatomorphic; nectary reduced to a double-connate, dorsal gland, 2×2 mm, maroon, glabrous. Fruit not seen.

TYPE: COLOMBIA: VALLE: old road from Cali to Buenaventura, below La Elsa, plants on clay cliff near waterfall and epiphytic, deceptively looking like begonias, 30 April 1972, Wiehler, Dressler, N. H. & N. F. Williams 7261 (SEL, leaves only); cult. at SEL under acc. no. W-1644, herb. specimen prepared 13 May 1975, Wiehler 75270 (HOLOTYPE: SEL).

DISTRIBUTION: Colombia, known only from the type collection in Valle del Cauca.

25. *Paradrymonia tylocalyx* Wiehler, sp. nov. (Plate 13:D)

Habitu *P. albae* Wiehler et *P. metamorphophyllae* (Donn. Smith) Wiehler similis, sed differt a prima foliis ellipticis vel lanceolatis, calycumque lobis serratis, a secunda bracteis subulatis, et ab ambabus corollis majoribus maculatis.

Epiphytic or terrestrial, perennial, caulescent herb; stems suckering from the base, rarely branching above, erect, ascending or trailing, to 50 cm tall, ca. 1-3.5 cm in diam., the leaves sparse, absent from the lower parts of the stems, the internodes of irregular length, varying from 0.3-10 cm long, with a tan-colored bark, glabrescent; leaf pairs equal to extremely unequal, the petioles 9-11 cm long, tan, puberulous-sericeous, the lamina of the larger leaf of a pair elliptic or lanceolate, $25-40 \times 9-13$ cm, acuminate, denticulate, decurrent, stiff and leathery, medium green above, yellow-green below, the young leaves shiny sericeous, the mature leaves puberulous to glabrescent on both surfaces, the lateral pairs of veins 13-16, the opposing leaf similar, either equal in size or smaller, often only ca. 1 cm long, subulate, persistent or caducous. Inflorescences axillary or cauliflorous cymes of 4-16 flowers, the peduncle absent or in cauliflorous florescences a meristematic nub of 2-6 mm length, the prophylls and subtending bracts subulate and minute, ca. $0.2-0.9 \times 0.1$ mm, red, puberulous, the pedicels 0.5-1.2 cm long, green flushed with rose, sericeous; calyx lobes subequal, narrowly lanceolate, $1-1.5 \times 0.2-0.3$ cm, entire, green flushed with rose, sericeous, the sinus of each lobe with a prominent bright green, wart-like protuberance; corolla oblique in the calyx, salverform-infundibular, ca. 6-7 cm long, spurred, the tube rust-red above, cream-white below, glabrescent (but sericeous in bud), the back of the limb white flushed with rust-red, the face of the limb white, the lobes unequal, the 2 dorsal and 2 lateral lobes ca. 1×1 cm, glabrous, the ventral lobe ca. 1.5×2 cm, with short, glandular trichomes, the entrance dorsally bright yellow, with a ventral groove and 2 cushion-like, raised, orange-yellow areas, ventrally rust-red, with 2 prominent longitudinal white lines, and long glandular hairs, the tube inside white, dorsally with long glandular hairs; stamens 4, included, the filaments adnate for 20 mm to the base of the corolla tube, ca. 4 cm long, white, glabrous, the anthers coherent into a

square, each anther 2×2 mm, the thecae dehiscing by longitudinal slits; ovary 3 mm long, rose, sericeous, the style ca. 3.8 cm long, pink, pilose, the stigma stomatomorphic; nectary reduced to a double-connate, dorsal gland, 2×2 mm, white, glabrous. Fruit a bivalved, fleshy capsule, yellow-green, sericeous; seeds oblong, 0.9×0.4 mm, light brown, striate, with a fleshy funicle 2 mm long.

TYPE: *COLOMBIA*: VALLE: old road from Cali to Buenaventura, below La Elsa, plants on cliffs in soil and moss with long, trailing stems and few leaves, epiphytic deeper in forest, 30 April 1972, *Wiehler, Dressler, N. H. & N. F. Williams* 7253 (SEL); cult. at SEL under acc. no. W-1691, herbarium specimens prepared 13 May 1975, *Wiehler* 75271 (HOLOTYPE: SEL; ISOTYPES: BH, COL, F, K, NY, US, VALLE).

DISTRIBUTION: Colombia, known only from the type collection in Valle del Cauca.

Paradrymonia tylocalyx (*tylo* = Greek, with knobs, calluses, or projections) has several distinguishing features: the large leaves, held far away from the stem at an angle of about 30° , are stiff, rigid, hard and leathery, unusual for a gesneriad; the majority of the florescences are cauliflorous on the thick, bark-covered stems, arising from almost invisible leaf scars as peduncle-like protuberances of meristematic activity, producing series of flowers for several months; the calyx is decorated with bright and shiny green wart-like projections in the sinuses of the lobes, and the throat of the corolla displays two cushion-like, raised, orange-yellow areas at the starting point of the ventral yellow nectar-guide.

ACKNOWLEDGMENTS

I want to thank the curators of the herbaria cited for the generous loans of the specimens of Gesneriaceae, Dr. Robert L. Dressler and other botanists cited for continuing to produce new field collections, and our illustrators Lisa C. Megahee and Sharon Boothe for their excellent line drawings.

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